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THE EXCAVATION OF WESTFIELD (R11/898), SOUTH AUCKLAND

LOUISE FUREY

AUCKLAND

Abstract. The excavation of R11/898, Westfield, in South Auckland is described. The site, interpreted as an undefended settlement, was excavated in response to development. Postholes, a pit and evidence of cooking was uncovered, along with a number of artefacts of various types. It is suggested that although the main occupation of the site in the 16th century was of short duration, the settlement was not intended to be of a temporary nature.

The excavation of part of R11/898 (grid reference R11 750 735) was a salvage project authorised by Historic Places Trust (1981/51) and carried out prior to the construction of the Maui gas pipeline through the area. The site, formerly identified as N42/941, has been named Westfield for ease of identification. It was one of the few relatively undisturbed open settlement sites remaining in the Auckland urban area. A full report of the excavation is presented in Furey (MS). Field notes, photographs, artefacts and materials recovered are held in the Auckland Museum.

THE SETTING

Situated in the Tamaki-Otahuhu area of Auckland, the site is adjacent to the western side of the Southern Motorway, near what is known locally as 'Tip Top Corner' (Fig.1). The landscape would in the past have been dominated by two major volcanic cones within one kilometre of the site: Otahuhu (Mt Richmond) R11/13, and Te Apunga-o-tainui (McLennan Hills) R11/10, were both Maori pa. Te Apunga-o-tainui, which had extensive earthworks near the summit, has been totally destroyed by quarrying for basalt. The volcanic lava fields (Flatrock) to the east of Te Apunga-o-tainui and bordering the Tamaki River, have several open settlement sites, not unlike R11/898 from surface features, and evidence of garden systems (Sullivan 1972:153). Hamlins Hill (R11/142), a large hill to the north-west of R11/898, also an open settlement site, has had the lower knoll progressively excavated over a number of years. This hill however is on the edge of the volcanic soils and is composed of Waitemata sediments overlaid by a thin deposit of volcanic ash (Walton 1979:115).

Red and brown volcanic loam soils are present over the wider area. These soils were fertile and free draining and well suited to the growing of kumara.

The Tamaki-Otahuhu area is a narrow strip of land between the Tamaki River and the Manukau Harbour and was an important focal point in pre-European times, allowing easy access between the east and west coasts. Several portages or crossing

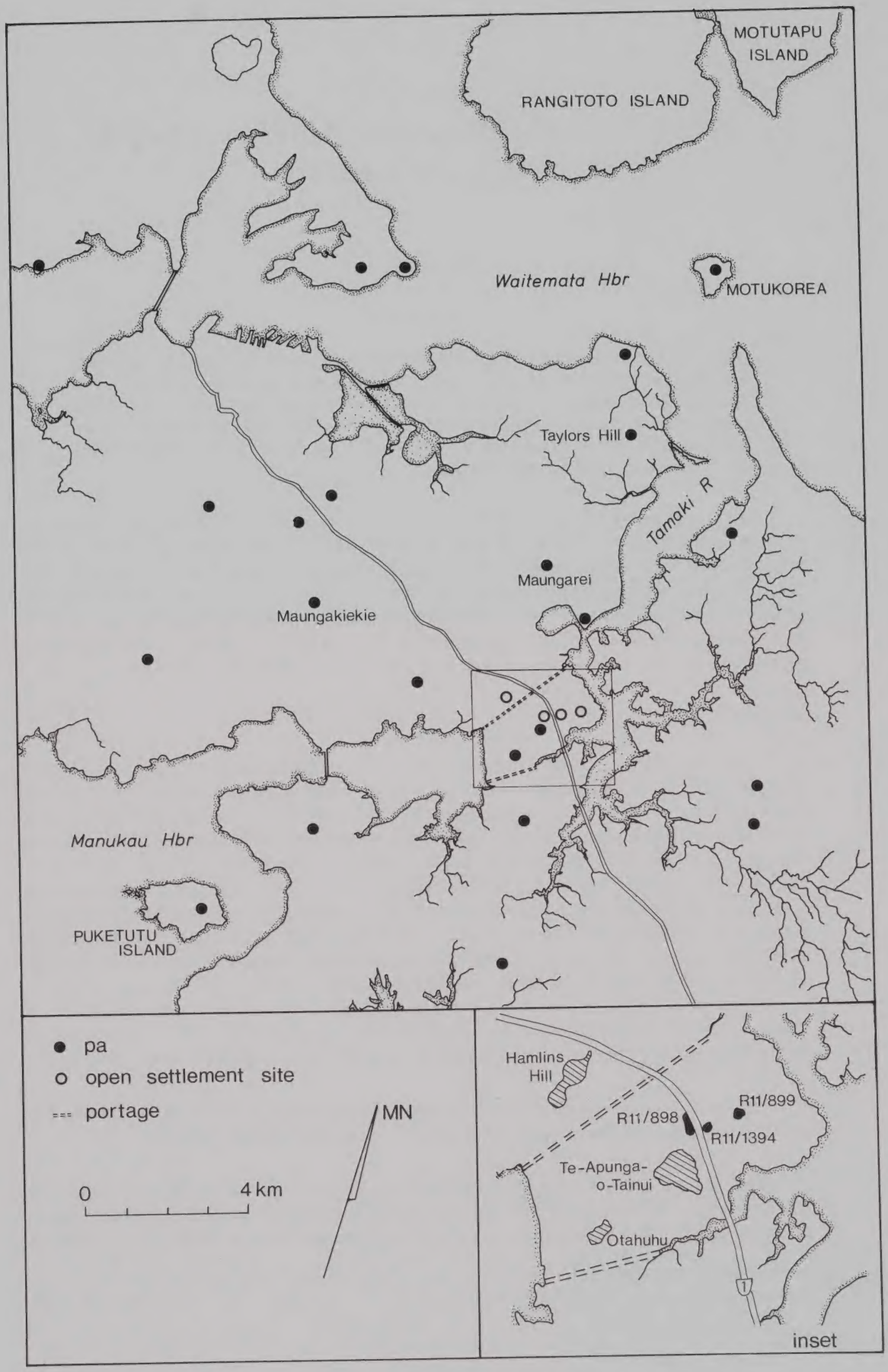


Fig.1. Location map of R11/898, Westfield.

places are known. Te Toangakiotahuhu or Otahuhu (Simmons 1980:32) was one kilometre long and crossed from the head of the Otahuhu Creek to the Manukau Harbour. A second portage, Karetu, two kilometres long, followed a route from Anns Creek across the base of Hamlins Hill to the Tamaki River (Brown 1954:174).

The site (R11/898) is on a low hill approximately 200 metres long with a height of about five metres above the surrounding flat land. The hill was present before Te Apunga-o-Tainui erupted, during which basalt lava breached the volcano's tuff ring and flowed away to the north and east, stopping at the Tamaki River (Searle 1981:125). Lava covered the hill in an irregular fashion, following the underlying ground configurations. The lava was subsequently covered with ash thrown out of Otahuhu (Searle 1981:131). Over time erosion has left rocky high points and steeper slopes exposed, with redeposition of ash in the hollows and at the base of the slope.

Surface features on the site consisted of shell midden protruding through the grass, several terraces and two pit depressions near the southeastern end (Fig.2). Early aerial photographs (1940) show the southeastern end extended further to the east (pictured in Searle 1981:132). However this toe was truncated by motorway development. Shell midden exposed through the vegetation adjacent to the motorway indicates some cultural material was disturbed during construction work. A house has been situated on the hill, disturbing the central area of the site.

The Maui pipeline easement was to affect only the easternmost end of the site. The area to be excavated consisted of three vague terraces on the southeast facing slope. Shell midden was visible below the uppermost terrace. A level surface was present above the slope.

THE EXCAVATION

The excavation strategy was to intersect both the flat area at the top of the slope and the terraces. A strip 4.5 m wide and 25 m long was initially excavated with adjacent areas being opened up as excavations progressed. A total of 244 m^2 was excavated over seven weeks from October to December 1981.

The recording system was based on a continuous grid, similar to the co-ordinate method used on maps where the 'origin' is in the southwest corner. Artefacts and samples could be located precisely within the overall recording grid.

The excavations were termed Areas 1-6, partly indicating the sequence in which work progressed and providing for rapid broad-level relocation.

Area 1, and the adjacent Area 6, were on the level surface at the top of the slope (Fig.3). Areas 2, 3, 3/East and 4 were situated over the three terraces descending down the slope. Area 5 was on the eastern side of Area 2, and Area 2/West on the western side. Both were excavated to investigate the areal extent of the shell midden.

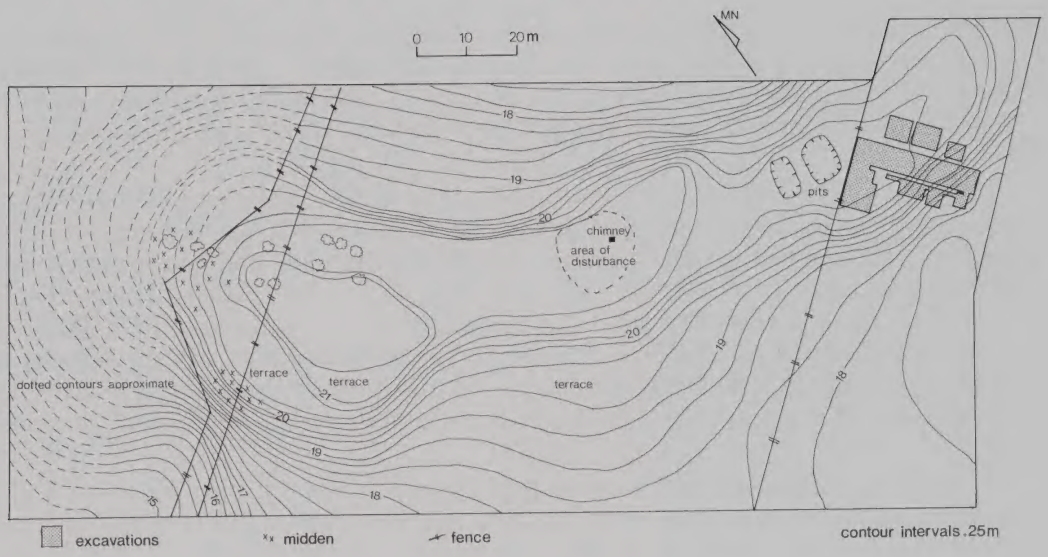


Fig.2. Contour map of R11/898, showing the excavations.

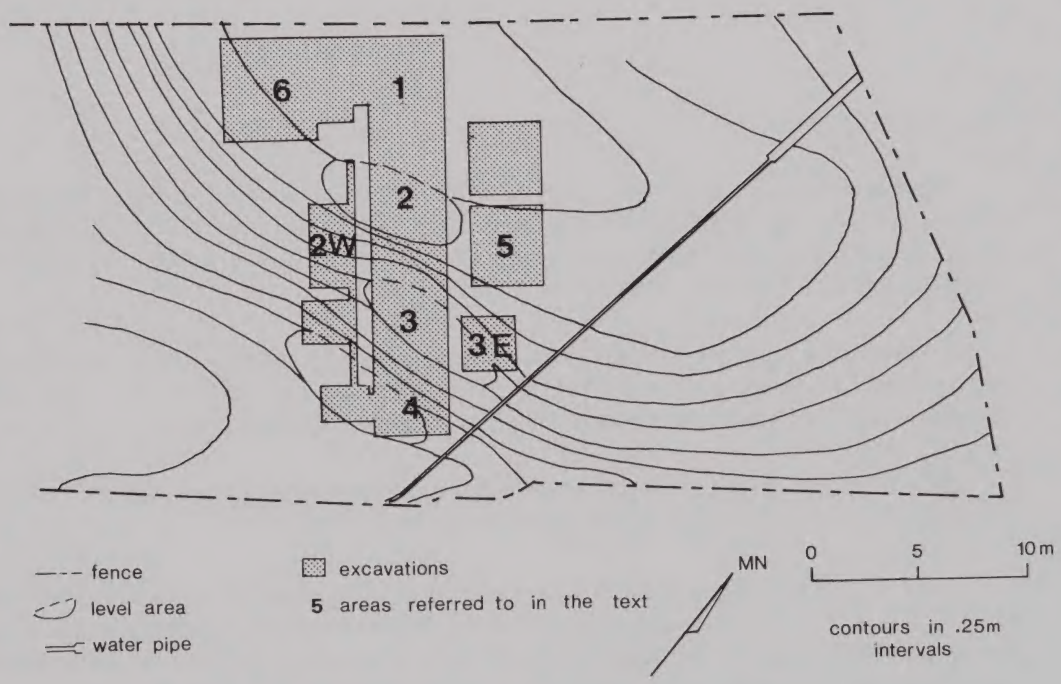


Fig.3. R11/898: the excavations showing site areas referred to in the text.

STRATIGRAPHY

The overall stratigraphy of the site was not complex. The main layers were present over the entire excavated area with localised lenses, particularly of midden, present in different areas (Fig.4).

Layer 1A, the turf zone and topsoil, was a dark brown friable loam up to 100 m in depth. This layer contained recent material including sheep bones, nails, bottle glass and coins.

Layer 1B was similar in texture and colour to Layer 1A. The difference however was in the inclusion of charcoal flecks. This layer was present over all the site with the exception of the steepest part of the slope. There were several variations in the colour, the darker ones being due to staining from charcoal concentrations. Stone and obsidian flakes occurred at the interface of Layers 1A and 1B. Several postholes also occurred at this level, indicating the upper part of Layer 1B was a cultural surface (Occupation II).

Layer 2, the shell midden, occurred in four separate areas (1, 2, 4 and 5) but could only be called a substantial deposit in Area 2 where lensing within the layer was evident. Lens 2A was a thin lens of crushed shell overlying Lens 2B, which was up to 500 mm deep and consisted of whole shells. Lens 2C was limited in extent and consisted of crushed and burnt shell in a matrix of wood ash and charcoal blackened loam. The lens was interpreted as fire rakeout from the cooking area. Lens 2D was sparse shell and bone in a clayey silt loam matrix, similar to Layer 3.

Layer 3, a dark yellowish brown slightly silty clay loam, was the natural subsoil through which basaltic lava protruded. A mottled interface zone containing charcoal fragments was present between Layers 3 and 1B. Artefacts and features could be assigned to this zone. This is termed Occupation I, the first on the site, although the specific sequence of events within this occupation cannot be determined.

Several test pits were dug to examine the natural soil profile on the site. Three distinct horizons were evident.

A. Horizon (topsoil) — a dark brown loam up to 70 mm in depth.

B. Horizon — a brown loamy transitional zone, up to 150 mm deep, between the topsoil and the subsoil.

C. Horizon (subsoil) — a dark yellowish brown silty clay loam which with increasing depth became more clay-like. This was the weathered Otahuhu ash, equating with Layer 3 in the excavations.

STRUCTURAL EVIDENCE

A number of postholes and firescoops, a pit with a drain, and a stone backed fireplace were excavated. The features will be described and discussed by excavation area, as they appear to reflect spatially distinct activities.

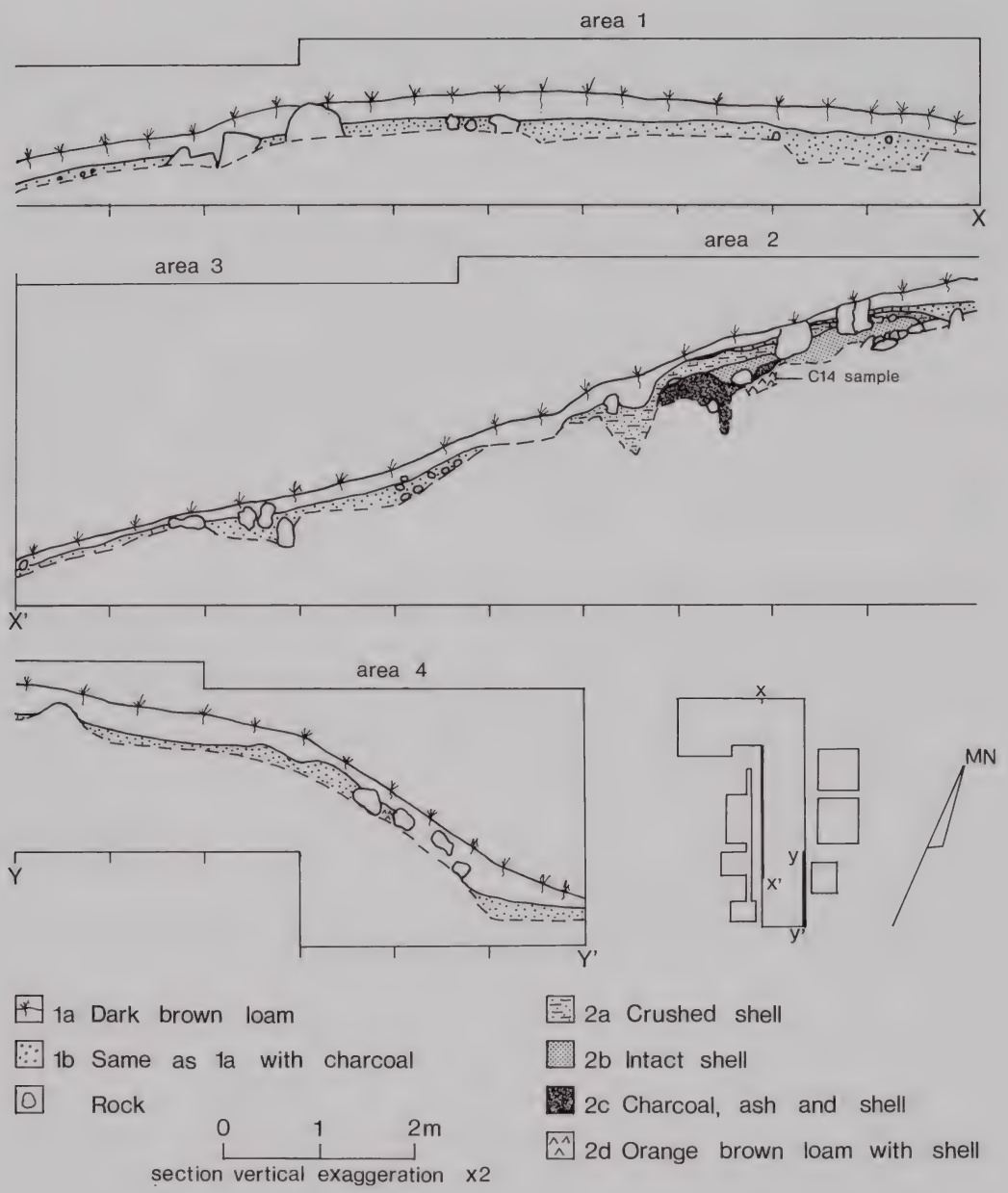


Fig.4. R11/898: cross-section through the site.

Areas 1 and 6 (Fig.5) contained a stone free area within which there were 34 postholes varying in depth from 50 to 340 mm. Several were elongated in shape. All but four of the postholes can be assigned to the earlier occupation of the site, cut from the interface zone between Layers 1B and 3. A pattern to the postholes is not immediately obvious. However from the number of postholes it is apparent several superimposed structures, which continue into the baulk on the northern side, are represented.

One structure can be inferred from a rectangular-shaped feature defined by shallow scarps, and interpreted as the foundation for a small dwelling. The small circular depression filled with stones and charcoal was probably a fireplace or hearth within the structure. Three equally spaced postholes are roughly aligned through the long axis of the feature. Their contemporaneity with the feature was however not established. A plot of the lithic material from the first occupation showed an absence of flakes coinciding with the outline of the feature. This suggests a relationship, and possibly the structure was the last in a succession of buildings in the one place.

Area 1 had few features in comparison to Area 6, probably explained by the stoniness of the subsoil. Shell midden filled a long shallow depression at the base of which were five postholes. These appeared to predate the midden. A firescoop, filled with black loam, charcoal and small cobbles, was adjacent.

The distribution of stone material for Occupations I and II showed a marked change. Within Occupation I the stony part of Area 1 was used to some extent for either flaking or discarding of waste flake material. However there is almost a complete absence of material relating to the earlier occupation in this area. This contrasts strongly with the evidence from the adjacent Area 6 where stone working was an important activity in both occupation periods.

Areas 2, 2/West and 5 (Fig.6) encompassing the uppermost terrace, can be discussed as one unit as the shell midden extended through all three areas.

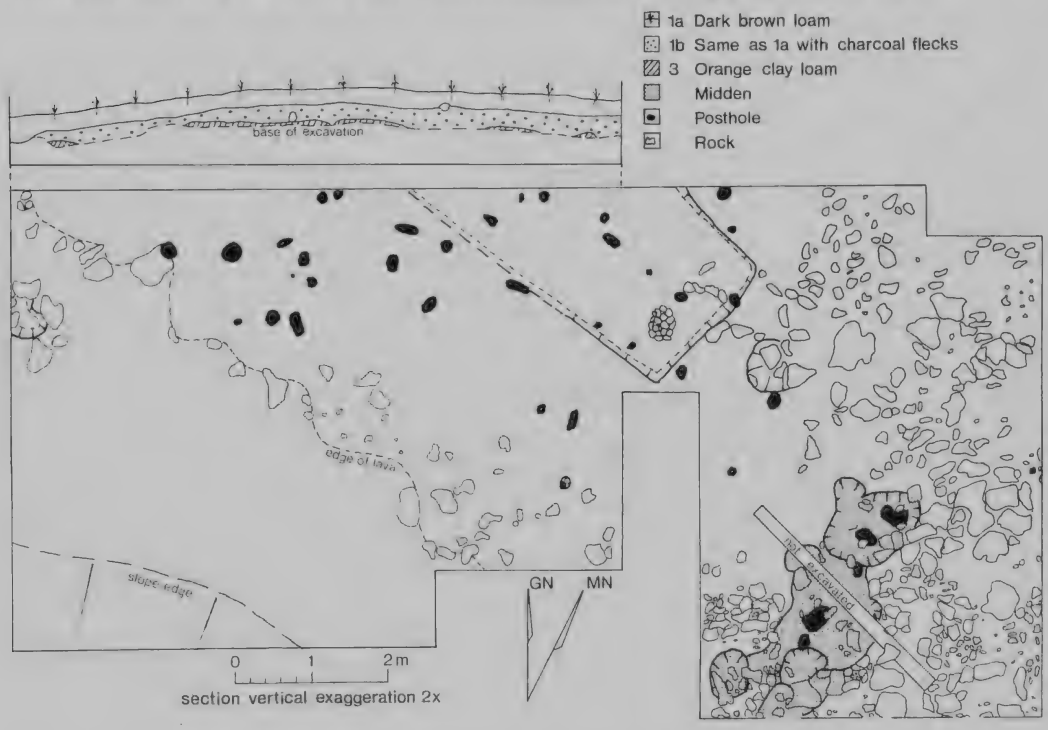


Fig.5. R11/898: plan of excavations, Areas 1 and 6.

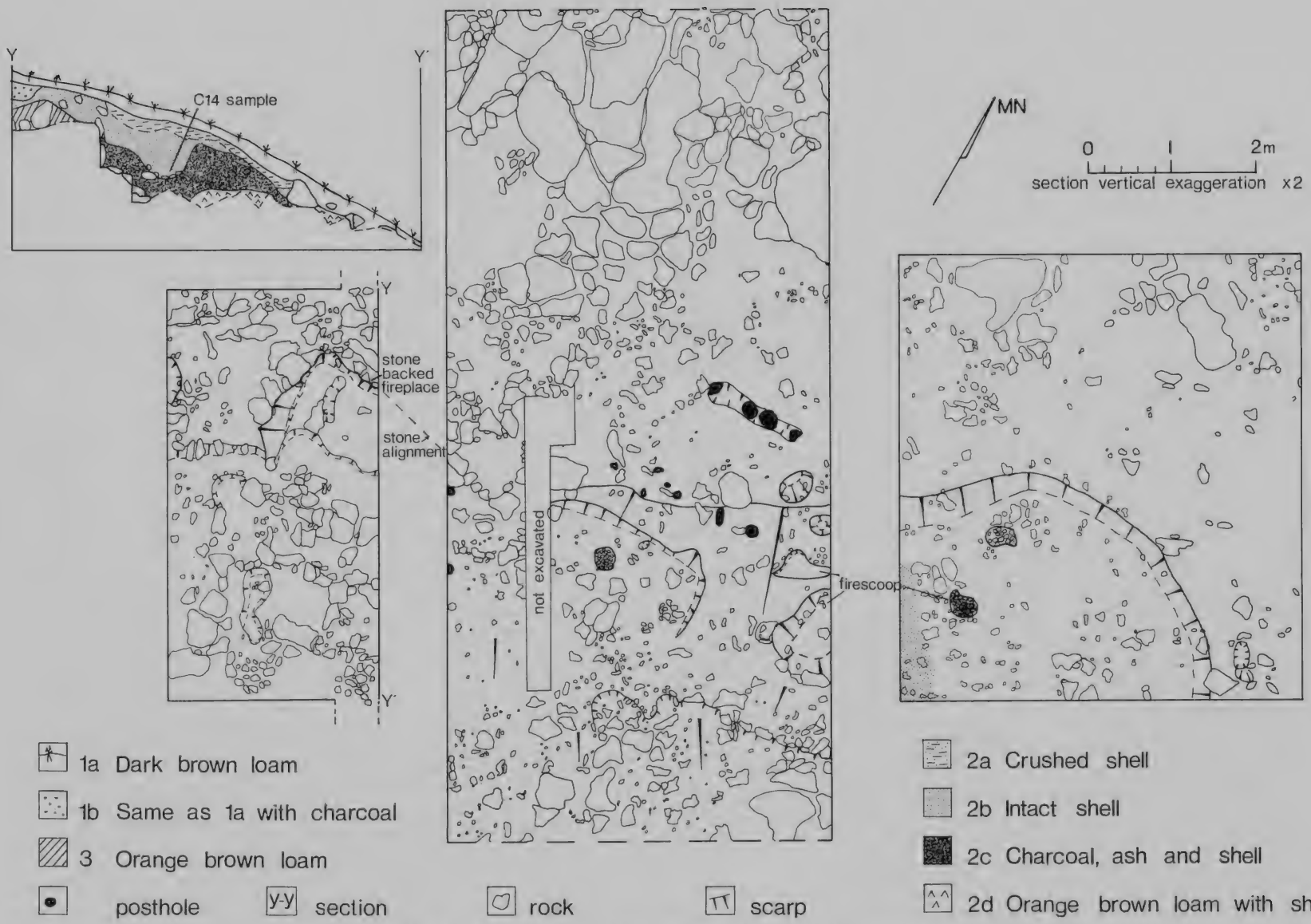


Fig.6. R11/898: plan of excavations, Areas 2, 2/ West and 5.

The original interpretation of the level area as a constructed terrace was incorrect. Lava protruded through Layer 3 in a number of places, indicating its use as a residential terrace was very unlikely. The 'terrace' was natural, probably formed by an undulation or irregularity in the lava.

Layer 1B covered the shell midden where the surface was level but was absent where the slope was steepest. Flakes of obsidian were present at the interface of the topsoil and Layer 1B, and also within the midden. Beneath the lenses of shell, postholes and firescoops were cut into Layer 3.

Several of the postholes, which were up to 200 mm deep, were in a shallow slot. These have been interpreted as part of a windbreak to protect the cooking area from draughts and wind gusts.

In the initial use of this area, the 'terrace' had been modified and a front scarp 300 mm high was formed. This presumably also functioned as a windbreak for the firescoops at the base of the scarp.

Firescoops were of two types: shallow circular depressions filled with small fire-reddened scoria cobbles and charcoal, or a deeper more irregular shaped feature with charcoal pieces and wood ash in the base. The firescoops in the lower level, predating midden deposition, were of the former type while those cut from the surface of the shell midden were of the latter type. This may reflect a difference in cooking techniques or the type of food prepared.

Firescoops with cobbles were also present in Area 5, the easternmost extent of the cooking area. A shallow semicircular-shaped scarp confined the firescoop features.

Covering the firescoops was Lens 2D, a silty loam containing small amounts of shell and bone. Two bone needles and the shell pendant were within this layer.

The cooking activity in the main part of Area 2 seems to have ceased with the deposition of the midden. After Lens 2D was laid down, several stone alignments were placed across the slope and filled in behind with wood ash, crushed shell or concentrations of greasy black loam.

The focus for the cooking activity shifted to Area 2/ West where firescoops and a fireplace backed by a vertical scarp faced with stones were present. The fireplace was stratigraphically later than Lens 2D as a stone alignment, part of the construction of the fireplace, was resting on Lens 2D in the central excavated strip. Lens 2C, a fire rakeout, probably originated from the firescoops. This layer was up to 600 mm deep near the stone backed fireplace but thinned rapidly to be only a few millimetres thick in the main excavation area. Lens 2B, a layer of whole shells, covered the entire area. However firescoops were also cut into Lens 2B in both Area 2/ West and the main Area 2 excavation.

Area 3 had little in the way of features. The excavated strip intersected only the western end of the terrace. The extension, Area 3/East, across the central part of the terrace, had a stone alignment at the back of the terrace which had the function of retaining small stones present on the scarp. Two features, cut into Layer 3, were excavated. One had small stones arranged in a circle around the outer edge of the depression and both contained charcoal and fire reddened cobbles. There was no evidence of postholes, which was not surprising given that bedrock was present immediately below Layer 1B over much of the terrace surface.

Area 4 (Fig.7) at the base of the slope, intersected the lowest terrace. Two postholes, a pit containing a sump and an associated stone filled channel were present. All features can be assigned to the earlier occupation. This terrace differed from the others in that it was cut into naturally re-deposited ash and loam. Layer 1B filled the pit and sealed in the channel, both of which were cut into Layer 3. The pit was, on average, 250-300 mm deep, with an uneven floor surface through which bedrock protruded in several places. The sides and base of the pit were unweathered, suggesting it was not used for any length of time or left open after its usefulness ended. In the southwest corner of the pit, a depression filled with scoria cobbles was interpreted as a drainage sump. The base of the sump was 380mm lower than the floor of the pit. Connected to the sump was a flat bottomed channel, external to the pit, which could be traced across the terrace towards the front edge. The channel was on two levels, with the section closest to the sump being on a lower level relative to the ground surface. The outer section was filled with scoria cobbles. The system, if it was designed for drainage, would not have been very effective and would be more likely to channel water into the sump rather than out of it. It could only act in reverse if the sump filled completely with water, in which case the drain would take the overflow, but once the

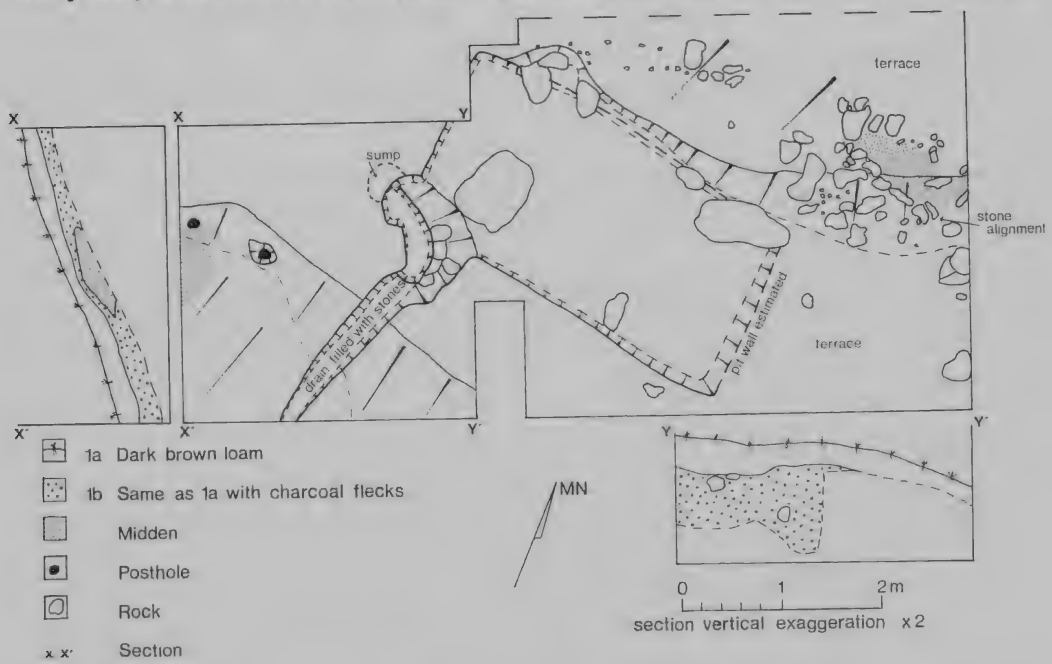


Fig.7. R11/898: plan of excavations, Area 4.

water level dropped below the level of the channel lip, the sump would continue to hold water with no means of escape other than natural percolation through the soil. On the basis of the apparent inefficiency of the channel system to remove water, the pit cannot with any certainty be interpreted as a feature for the storage of vegetables such as kumara.

A stone alignment on the backscarp of the terrace retained a shallow deposit of midden originating from Area 3 above. Two postholes filled with shell midden were present on the western part of the terrace. These did not appear to be related to the pit feature but belonged to the same occupation period.

Discussion of the structural evidence and occupation sequence

In this excavated part of the site the evidence for the earlier occupation is stronger than that for Occupation II.

Housing in Area 6, cooking in Area 2, and stone working over much of the excavated area can be inferred for Occupation I. In addition, the construction of a terrace at the base of the slope and a pit with an elaborate form of drainage can also be assigned to this period. The large number of postholes in Area 6 suggests several structures are represented. On the basis of this evidence, the site may have been occupied for some considerable time within what is termed Occupation I. Some truncation of the ground surface has occurred in Area 6 as stone flakes were found resting directly on the subsoil and the pre-occupation topsoil was absent. In addition, several shallow postholes may originally have been deeper.

Firescoops, a larger more intensively used cooking area and the midden dump in Area 2 are also part of the first occupation. The terrace surface in Area 3 was modified during the earlier occupation and used as a place for stone flaking. The terrace in Area 4 and the pit feature on it were also constructed during this period.

There is less tangible evidence for Occupation II. Lithic material and several postholes are all the evidence there is, suggesting the main part of the settlement is away from the excavated area. It is likely that the focus of activity was on the top of the ridge rather than on the slopes.

RADIOCARBON DATES

Three samples of cockle shell were submitted to the Institute of Nuclear Sciences, DSIR, for radiocarbon dating. The result, given as new half life, are as follows.

NZ6163 from a shell lens in Area 1 produced an age estimate of 332 $\pm$ 59 B.P.

NZ 6164 was from Lens 2D, the earliest midden deposit in Area 2, giving a date of 421 $\pm$ 59 B.P.

NZ 6165 was from Lens 2B in Area 2/West. The date was 309 $\pm$ 59 B.P.

All three samples date activities predating Occupation II for which no dates are available. It appears the site was occupied in the late 16th century and the events the samples date may be assumed to have occurred within a short space of time.

FAUNAL REMAINS

Shellfish

Midden samples were taken during excavation from Areas 1, 2, 4 and 5. Twenty-one species of shellfish were present in the analysed sample, but only seventeen species are likely to have been gathered for their food value. The shellfish were gathered from several ecological zones (estuarine, rocky shore and open coast) indicating a wide range collection of species..

The greatest number of shellfish species were from an estuarine or soft mud environment. *Chione* (*Austrovenus*) *stutchburyi* (cockle) was the dominant species, accounting for over 95% of the shellfish in each sample. *Paphies australis* (pipi) and *Amphibola crenata* (mudsnail) were present in smaller quantities. Other estuarine species present in very small quantities were *Cominella adspersa, Mactra* (*Cyclomactra*) *ovata ovata, Maoricrypta* (*Zeacrypta*) *monoxyla, Zeacumantus lutulentus, Venerupis* (*Paphirus*) *largillierti, Diloma* (*Fractarmilla*) *subrostrata subrostrata, Diplodonta* (*Zemysina*) *striatula, Alcithoe arabica* and *Pecten novaezelandiae.*

Two suitable environments in close proximity to the site are the Tamaki River Estuary, approximately 1 km to the east, and the Manukau Harbour 1.5 km to the west. It is unlikely that species such as *Pecten novaezelandiae* (scallop) were found in the estuary, and they were probably obtained from either the Manukau Harbour or the Waitemata Harbour.

The rocky shore species were also more likely to be from further afield in the Manukau Harbour or the Waitemata Harbour. Species in the midden samples were *Turbo smaragdus, Crassostrea glomerata, Haustrum haustorium, Haliotis* (*Paua*) *iris, Perna canaliculus* and *Maoricolpus roseus roseus.* Paua in particular is not suited to an intertidal zone and is therefore more likely to have been found near the Manukau Heads. The remaining rocky shore species occur in the intertidal zone.

Paphies (*Mesodesma*) *subtriangulata subtriangulata, Dosinia* (*Phacosoma*) *subrosea* and *Dosinia* (*Austrodosinia*) *anus*, all species suited to an open environment such as that found in shallow water off coastal beaches, were also present. The nearest places to the site for these conditions would be Takapuna Beach or the northern side of the near islands of the Hauraki Gulf, such as Motuihe (Morton & Miller 1973).

Bone

The bone material was found predominantly in the midden in Area 2. *Canis familiaris* (dog), *Rattus exulans* (rat), fishbone and birdbone were present.

The dog bone was fragmented but a wide range of skeletal parts are represented. At least two, and probably three, individuals are present. This minimum number is derived from the presence of four pelvic fragments which include the femur socket.

Although lefts and rights are equally represented, if matched for size there are almost certainly three individuals. One juvenile is present, indicated by three small thoracic vertebrae and by a tarsal which is noticeably smaller than the others present.

At least nine rats are estimated from counting right femurs and a number of other body parts were present.

Two identifiable species of fish were present — *Chrysophrys auratus* (snapper) and *Thyrsites atun* (barracouta). Minimum numbers of individuals for each species are estimated from the head bones. At least eighteen snapper are represented ranging in size 250-700 mm. Three barracouta were present. Several vertebrae of a small cartilaginous fish were also identified.

A small amount of birdbone was present. This was mainly in the form of undiagnostic shaft fragments.

Landsnails

Several species of landsnails were present in the midden samples. Two species (*Mocella* sp. and *Charopa* (*Egustula*) *egesta*) sensitive to a drying out of the local environment indicate some bush or rotting logs were on, or very near to, the site. The presence of these sensitive species precludes scrub or bracken fern vegetation near the site at the time of midden deposition. Other species (*Phenocohelix giveni, Phenocohelix ponsonbyi, Carellia* sp., *Mocella eta* and *Punctid* sp.) are more tolerant to changes in the local environment.

ARTEFACTS

A large number of artefacts of various types were recovered from the site. In addition, an extensive assemblage of stone flakes including obsidian, chert, greywacke and argillite was present. The artefacts demonstrate a number of activities were being carried out on the site and a wide range of raw materials were used: bone, shell, greenstone, stone of various types, baked clay and basaltic scoria.

The greatest variety of artefact types comes from Occupation I: a shell pendant, two bone needles and approximately half the adzes, obsidian and stone flakes. The recovery of such a large number of artefacts from an Auckland site of this age is unusual, matched only by two other excavated sites, R10/31 on Motutapu Island (Leahy 1970) and R11/96 Taylor's Hill (Davidson pers. comm.).

Adzes

Five adzes or roughouts, and pieces of six other adzes, were excavated. Two greenstone chisels completed the assemblage. All of the adzes are of a rock type commonly referred to as greywacke although those in a fine grained greywacke, or siltstone, have been tentatively sourced to the Port Waikato area, as opposed to the Hunua/Hauraki area.

Only one complete adze, made of fine grained greywacke, is highly finished, having approximately 75% of its surface ground (Fig.8). There is a slight bevel, triangular in shape,and the chin is skewed to one side. One other adze (Fig.13), the butt end of which is missing, shows the same degree of finish. The stone material is also a fine grained greywacke.

In general shape and cross-section the remaining adzes and roughouts follow the local adze type described by Davidson (1982:44) which tends to be less regular in form and finish than adzes from outside the Auckland area. The cross-sections are asymmetrical or rough rectangular. Materials used on this site reinforce the notion of a local manufacturing of the artefacts as the stone sources are within a 100 km radius of the site.

Two complete adzes (Figs.9, 10) have no evidence of hammerdressing but show partial polishing and flake scars. The rock material, with a greenish colour, is similar to the greywackes found on islands in the Hauraki Gulf. The small adze (Fig.10) has grinding on front and back surface. The straight blade shows signs of much use with flakes removed and blunting of the edge. In contrast, the adze illustrated in Fig.9 has been partially ground on the back. Made on a flake, the striking platform and positive bulb of percussion are evident on the front. The straight blade is very blunt and is probably not finished.

Greywacke boulders have been used as a raw material in adze manufacture. A roughout (Fig.11) shows evidence of the cortex on one side. Hammerdressing is evident on the front and sides, particularly in the area of the incipient bevel. The artefact requires blade and bevel formation in addition to polishing.

Pieces of six other roughouts or broken adzes were found. While most of the adzes and roughouts have a cross-section which is irregular in shape, two pieces stand out as being different. A quadrangular cross-section is evident on one roughout piece (Fig.12) which is hammerdressed over much of the surface. One large flake has been removed from the blade area. The butt has broken off. The second anomaly, represented by a blade, was made on a flake struck off a water worn boulder. The sides have been flaked and lightly hammerdressed. The cross-section is rounded triangular in shape and differs from the remainder of the adze forms on the site. The stone material is a light grey fine-grained greywacke.

Greenstone Chisels

Two greenstone chisels (Figs.14, 15) were found in Area 6 at the top of the slope. The larger chisel has a curved blade from which several small chips have been removed (Fig.14). The other chisel (Fig.15), although damaged at the poll end, has the remnants of a bevel. This suggests the chisel was reworked to produce a cutting edge at the other end.

Figs. 8-13. Adzes from R11/898.

Bone Needles

Two bone needles were found in the midden area. One needle, 44 mm in length, is complete and has a slight curve at the point end. The second needle has no point, and is thicker. The eye in both needles has been formed by a sawing technique rather than the usual drilling method associated with needles from North Island sites (Davidson 1984:74). In addition, a notch is present in the end of each needle above the eye. The small size of the needles, and the thread holes in particular, suggest fine sewing of garments was being carried out on the site.

Shell Pendant

A pendant fashioned from a dog cockle (*Glycymeris laticostata*) shell (Fig.16) was found near the bone needles in Lens 2D. The radial ribs of the shell have been ground down to a smooth surface but the pattern remains. This however did not form part of the visible decoration as the plain side was worn uppermost. This is demonstrated clearly by the wear and use-polish present on the patterned side. Two drilled holes enabled attachment to a neck cord. Both holes are broken out on the sides, and a central hole was started from the back but not completed.

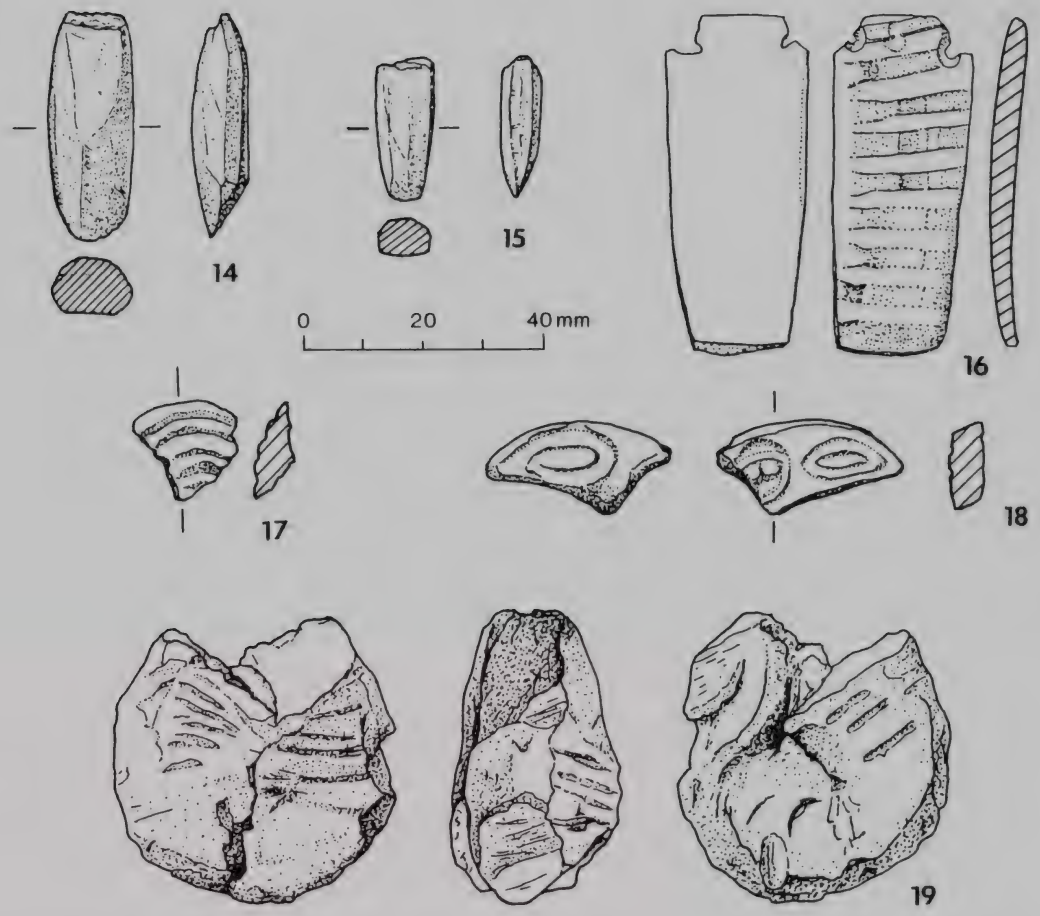
Several pendants of a similar form are present in museum collections and have been termed "rei-puta-like" on account of the reduction in width towards the lower end and the slight outward curve (Furey 1986). The pendant from this site is however flat in profile but displays many similarities to the other known pendants of this type.

Baked Clay

Two pieces of decorated clay were also present. One (Fig.17) is a segment of a larger object and has curved incised lines, part of a circular or spiral pattern. The other piece (Fig.18), is also incomplete but in shape resembles half a crescent. The incised decorations on the front and back surfaces are ovoid, and the upper and lower edges have been flattened and smoothed. The clay from which these objects were made is of a fine texture and whitish in colour (as opposed to the local red or orange clays). This type of clay is not found in the Auckland area, and is possibly from the vicinity of Port Waikato (pers. comm., geologist, Western Potteries after a visual examination of the pieces).

It is likely the pieces were incised before firing, merely because of the apparent control over the designs and because it would be easier to execute the decoration on a softer pre-baked material. However it is difficult to be quite certain about this.

A roughly circular object with grooves on the top is also made from clay (Fig.19). It has been formed by coiling a roll of wet clay and pressing the edges together to form a join. The sides have been flattened. A partial finger print and two crescent shaped fingernail impressions are present on the underside. The width of the grooves, which radiate out from the centre of the object on the upper side, are consistent with the width of a bone needle and it is suggested the object was used for shaping or sharpening bone needles. Identification of the material by x-ray diffraction showed it



Figs.14-19. Artefacts from R11/898. 14,15. Adzes. 16. Shell pendant. 17-19. Clay pieces.

to be clay, consistent with having been fired at greater than 600° C (R. Brash, geologist, pers. comm.).

The presence of baked clay is not unique to this site. Decorated clay pieces have also been found in excavations on Hamlin's Hill.

Hammerstones

Four hammerstones were found, the largest of which weighed 1.36 kg. Three were found in Area 3. This correlates with the waste stone chips and adze flakes to suggest maintenance work on adzes was being carried out there.

Burnishers

Several pebbles with polished surfaces were collected. It is likely these were used as burnishers or rubbers. The porcellanite pieces were also possibly used as burnishers.

Miscellaneous

Other artefacts recovered include a fishing net sinker fashioned from a scoria bomb, and part of a bone fishhook shank and base which has been burnt. This specimen is part of a two-piece oval lapped small hook as described by Crosby (1966:192). The broken butt of an adze appears to have been reshaped by the removal of flakes to form a triangular shaped point or awl. The point itself is absent but the artefact was probably used for drilling holes in wood.

Obsidian flakes

A total of 626 pieces of obsidian were recovered, representing 52% of the lithic material. Of these, 23% were not included in the analysis, having a maximum dimension of less than 10 mm. Forty-three cores were recovered. Generally the flakes were small, and the utilised edges very small, suggesting use for a specialised activity. Within the utilised flakes, 86% had working edges less than 10 mm in length, and 64% were less than 6 mm. Edge damage on flakes took the form of "nibbling", or the presence of tiny uniform flake scars. The majority of the utilised flakes (72%) had unifacial edge damage caused by using the tool in a scraping motion. Retouch, to blunten an edge other than the working edge, was present on 14% of the utilised flakes.

While there were no formal tool types present, 6% of the pieces were long and narrow with a straight chisel-like working edge. All but one was assigned to Occupation I. Two examples had damage on the sides, possibly caused by a haft.

Both green and grey obsidian was present. Overall green obsidian made up 26% of the assemblage. Within Occupation I, 31% of the obsidian was green, reducing to 21% in the second occupation (Table 1). The obsidian has not been source analysed. However, the green flakes are probably from Mayor Island and the grey obsidian is likely to be from several sources. The distribution of obsidian was variable within the site. Area 6 had the largest number of both periods of occupation (Table 2). Area 5, lower on the slope, also had a high number. Both areas had a large proportion of utilised edges.

Table 1. Obsidian Type by Occupation.

	Total No.	Green	Grey	% Total Utilised
Occup. II Layer 1	136	29	107	27
Occup. I Layer 2	42	13	29	7
Layer 3	302	93	209	65
	480	135	345	

Table 2. Distribution of obsidian by Area and Occupation.

	Area	Total No.	Green	Grey	% Total Utilised per Occ.	% Flakes Utilised in Area
Occup. I	1	28	6	22	9	53
	2	60	16	44	15	40
	3	80	27	53	22	45
	4	10	4	6	2	40
	5	70	21	49	18	38
	6	96	32	64	33	56
		344	106	238		
Occup. II	1	5	1	4	5	60
	2	2	—	2	—	—
	3	16	3	13	2	6
	4	—	—	—	—	—
	5	22	7	15	27	77
	6	91	18	73	66	45
		136	29	107		

Stone Flakes

There were a number of similarities between obsidian and other stone materials. In total 582 flakes and cores were used in the analysis, with a further 72 pieces (11% of the total) being too small to have been used as tools. Over half of these small waste flakes came from Area 6 and all but two of the remainder were from Area 3.

Usewear damage was found on 21% of the pieces. Greywacke accounted for 64% of the used flakes and chert for another 24%. Occupation I had 65% of the utilised flakes. With the exception of three chert cores, usewear occurred on flakes, several of which had flecks of kokowai adherring to the working edge. Unifacial edge modification is present in 79% of the utilised chert flakes and 71% of the greywacke flakes. Blunting was also included as a category of usewear as 13% of the chert, and 21% of the greywacke flakes had a blunt working edge. On over half of the flakes the length of working edge was less than 6 mm. This compared very favourably with a similar analysis of the obsidian. Again, like the obsidian, the majority of the utilised flakes are from Area 6.

Fifty-three polished adze flakes were recovered with 85% from Occupation I. In Occupation I, 24% of the adze flakes were from Area 6 and more than half of these had been re-used. Overall, the adze flakes came from Areas 2, 3 and 6. The latter two areas also accounted for almost all the small unanalysed flakes.

The stone materials used on the site were all from the Auckland region. Greywacke outcrops occur on the islands in the inner Hauraki Gulf while the chert is likely to be from a Coromandel source. Other materials present in small quantities were argillite, probably from the Hunua Ranges, quartz, sandy greywacke and a local porcellanite, formed by clay baking on contact with hot lava (Searle 1981:55).

Discussion of stone material

The distribution of the lithic material indicates clearly that there are areas of stoneworking and stone using activity on the site. In a comparison of percentages for different variables between obsidian and other stone material, it can be seen that there are a number of similarities. Both have a similar percentage of flakes with unifacial usewear damage and with a straight working edge. In addition, in each case 63% of utilised flakes have working edges less than 6 mm in length. This suggests that flakes of obsidian and other stone materials were being used in similar ways.

In Occupation I, Area 3 was an area where polished adzes were reshaped after being damaged. The butt end of a roughout was also found at the same level.

Area 6, in both periods of occupation, was where stone and obsidian flakes were used. Sewell (in Furey MS) has suggested that the small size of the tools and length of working edge, combined with unifacial edge damage, indicates the flakes were being used for an activity requiring a degree of control. This was possibly scraping or carving of wood. The presence of two greenstone chisels in Area 6 would tend to support this interpretation.

DISCUSSION

Excavations in a very small part of the overall site uncovered postholes, a cooking area and shell dump, stone working areas and a pit feature with an associated drainage system. The site may be interpreted as an undefended settlement where a number of activities took place.

From the evidence, it appears there may have been functionally discrete areas giving rise to an internal organisation of the settlement. Postholes show re-use of one area for a similar purpose. Similarly cooking, and dumping of shell waste, was confined to one part of the site.

It is likely that Area 6 contained some of the dwellings of the settlement in the first occupation, but the evidence for individual structures is far from clear. As an example, a house or shelter is inferred from a slightly sunken rectangular feature. However the posthole evidence to support this interpretation is less tangible. The estimated dimensions of the foundations fit within the size range of 1.5-2:1 length to width ratio, which Prickett (1982:119) arrived at from an examination of the ethnographic literature.

Two periods of use on the site are recognised. However, several re-occupations, perhaps on a seasonal basis may be represented by what has been termed Occupation I. The radiocarbon age estimates do show some variability although the order of dates is stratigraphically correct. The later occupation is represented by little evidence suggesting the excavated area was peripheral to the main part of the settlement.

The excavation of the three levelled areas on the slope, initially recorded as terraces, illustrated the difficulties in assigning functions to features visible on the surface. The uppermost level area, contained in Area 2, proved, on excavation, to be a natural feature. It is unlikely, given the uneven surface, that it was a living surface, although the terracette was modified by the construction of fireplaces, and later built up by the dumping of shell midden. The second level area, in Area 3, was more convincing as a constructed feature, although it is likely that this too was a natural feature which had been modified. The backscarp of the terrace in Area 3/East had been excavated or steepened. The lower level surface, in Area 4, does appear to have been a constructed terrace. Erosion and redeposition of the Otahuhu ash and Layer 3 at the base of the slope provided conditions more suitable for the construction of a terrace. Thus the Maori use of particular areas within the site can be explained in part by the geology and geomorphological history of the locality.

A diverse range of artefacts were found on the site. The presence of adzes and roughouts, together with stone flakes, polished adze flakes and hammerstones, suggests adze manufacture was an activity being carried out. The majority of the roughouts were hammerdressed but still required blade and bevel formation. The greenstone chisels and usewear on obsidian flakes suggest woodworking or wood carving was also being carried out.

The number and types of artefacts and the activities they represent suggest the site was not a short-term encampment within the gardens. Rather, the evidence indicates a settlement intended for longer duration where maintenance activities were carried out and there was time for projects, for example carving, not normally associated with temporary camps.

A review of the Maori traditional accounts and evidence placed before the Land Courts gives some insight into the settlement pattern of the Otahuhu area in the sixteenth and seventeenth century. A long association with the area may be inferred from the Tainui canoe traditions which in their various forms relate the hauling of the Tainui canoe across the portage from the Tamaki River to the Manukau Harbour. Several places in the general area have names related to this event (Simmons 1980).

Traditions also describe the settlement of the Otahuhu area by Tahuhu, who built a pa called Otahuhu. Kelly (1949:455) suggests this occurred in the 15th century. Ngai Tahuhu are mentioned in later traditions, probably attributable to about the mid-17th century, when they occupied "Otahuhu and several adjoining pas" (Graham MS.:6). Sullivan (MS.:11) suggests each pa housed a subdivision of the larger Tahuhu hapu, and Te Apunga-o-Tainui, on the basis of close proximity to Otahuhu, may have been one of the pa. Extending the argument further, she suggests Hamlin's Hill although

not visibly a defended site, may also be one of the pa alluded to. Davidson (1970:120) in interpreting the excavated part of Hamlin's Hill as an undefended site, does not discount the possibility of the upper part of the site being fortified at one time.

The settlement pattern of the Otahuhu area was probably influenced to some degree by the portages. The attraction of a narrow land mass which would allow people and canoes to be moved relatively easily between east and west coasts does not need to be stressed. The portages would therefore have been subjected to use by groups with aggressive as well as peaceful intentions. This was particularly so in the early 19th century when the main portage was used by Ngapuhi during their expeditions into the Waikato (Sullivan MS.:18-19). During such episodes it would have been expedient for the occupants of the Otahuhu area to move into the pa or make themselves scarce. Departure may in some instances have been hasty, leaving houses and gardens unattended until the threat had passed.

While pa were the settlement focus in times of stress, during more peaceful intervals people dispersed out to be closer to the gardens and set up home bases and temporary camps to gather food and other resources. R11/898 and Hamlin's Hill, together with several other open settlement sites in the vicinity can be interpreted in this way. It is likely also that radiocarbon dates from Westfield and Hamlin's Hill may provide a chronology, in broad terms, for settlement of the cone pa of Te Apunga-o-tainui and Otahuhu.

Open settlement sites are an important part of the settlement pattern, although often neglected archaeologically. Within the Tamaki isthmus, open settlement sites have had a low survival rate because of land development and urban encroachment. The excavations of open settlements on the Tamaki isthmus have all been carried out in response to development pressure. Hamlin's Hill, Alberon Park in Parnell (R11/120, Law 1970) and Westfield fit this category. Two other sites in the Otahuhu area, Hawkin's Hill (R11/1394) and Fisher Road (R11/899), have been investigated recently but are not yet reported on. Motutapu Island, in the Hauraki Gulf, also has had several excavations carried out on open settlement sites. Here, open settlement sites outnumber pa by 27:1 (Davidson 1978:329) which gives some indication of the number of undefended sites which might be expected to have been present on the landscape in the Tamaki isthmus.

Two radiocarbon dates are available from Hamlin's Hill. NZ 5962, with a date of 427 $\pm$ 77 B.P. (new half life), was on charcoal from short-lived species. The second sample, NZ 6156, of pipi shells, gave a date of 340 $\pm$ 45 B.P. Occupation of the site was interpreted as occurring sometime between A.D.1400-1700 (Pearce & Walton 1983). The dates from Westfield and Hamlin's Hill are similar and the sites may have been occupied close within the same general time range. This view is reinforced when other details from the sites are compared.

Hamlin's Hill had houses enclosed by fences, storage pits, stone covered drains and cooking areas which provided a comprehensive picture of the layout of an undefended site. The site, excavated over a number of years (Davidson 1970, Irwin 1975, Nichol 1980, Pearce 1975, Walton 1979), opened up a larger area than that on

any other open settlement site in the Auckland area. The excavation at Westfield indicated there was also an internal layout to the settlement, with areas set aside for specific activities. Each site appears to have had houses or structures of a similar construction. Elongated postholes, similar to those on Westfield, have on Hamlin's Hill been interpreted as holding house posts or slabs, with sections of wall of a lighter construction in between (Davidson 1970:116, Irwin 1975:82). Artefacts of baked clay, found on both sites, and not recovered from other sites in the Auckland area, also suggests a relationship. Finally, both sites are similar in age.

CONCLUSION

From the limited excavation at R11/898, the evidence suggests the site was more than a temporary camp within the garden areas. Activities such as adze manufacture and woodworking are more likely to be carried out at base camps. The presence of storage pits visible on the surface reinforces this idea.

Excavation of the site has contributed to an understanding of the settlement pattern in the Otahuhu area. The assemblage of artefacts provides a unique collection from an undefended site dated to the late-16th century.

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EXCAVATIONS AT TE PANE O HOROIWI (N42/365), ST HELIERS, AUCKLAND

BRENDA SEWELL

AUCKLAND

Abstract. The January 1982 excavation of a portion of the upper platform of the pa, Te Pane o Horoiwi, N42/365, at St Heliers, Auckland, is reported. Excavation established a sequence of activities: an initial period concerned with the building of defensive works around the perimeter of the citadel, the construction of a series of drainage ditches, the digging of a sequence of intercutting pits, and the construction of further defensive works and structures.

Excavation on one of the terraces revealed limited evidence of habitation but no evidence of defences. Lack of traditional evidence relating to occupation of this headland after 1750 suggests that the site was a stronghold of the Waiohua people prior to this date.

The pa, N42/365, at St Heliers, Auckland, was first recorded in 1978. The site is situated on the north-west rim of the St Heliers crater now known as Glover Park (Figs.1,2). Initial research into the site was carried out by Lady Aileen Fox, including the preparation of a plan, in conjunction with L. Diamond, on which Fig. 3 is based.

The owners of a private property applied to the Auckland City Council for a building permit to erect a house, which would destroy a portion of the pa. Archaeological excavation in January and February 1982 was carried out following application to the New Zealand Historic Places Trust to modify the site (Permit 1981/51).

The New Zealand Archaeological Association's files record a number of archaeological sites in the vicinity of the St Heliers crater (Fig.2). There are three groups of sites currently visible around the crater rim (N42/363, 364, 365). These have been allotted separate site record numbers although it is possible that occupation may have been continuous around the whole of the crater rim and slopes.

With the exception of two excavations, for which there are no published reports, archaeological investigations in this part of Auckland have been minimal. A salvage excavation took place on Taylor's Hill (N42/89) in 1955 prior to quarrying of part of the cone (referred to in Davidson 1978:6). A small salvage excavation was carried out by L. and H. Birks of part of the southern ditch of N42/365 in 1957 prior to destruction for housing subdivision. The approximate location of this excavation is shown on Fig. 3. Excavation revealed that the ditch was 1.2 m deep, rising to a height of 1.8 m to the top of the scarp and 2.1 m wide at its base. The base of the ditch was flat and there was no bank on the top of the inner scarp. The inner wall of the ditch consisted of a "hard cap"; in this *ko* marks were visible (L. and H. Birks, pers.comm.).

Fig.1. Location of N42/365 — Te Pane o Horoiwi, Auckland.

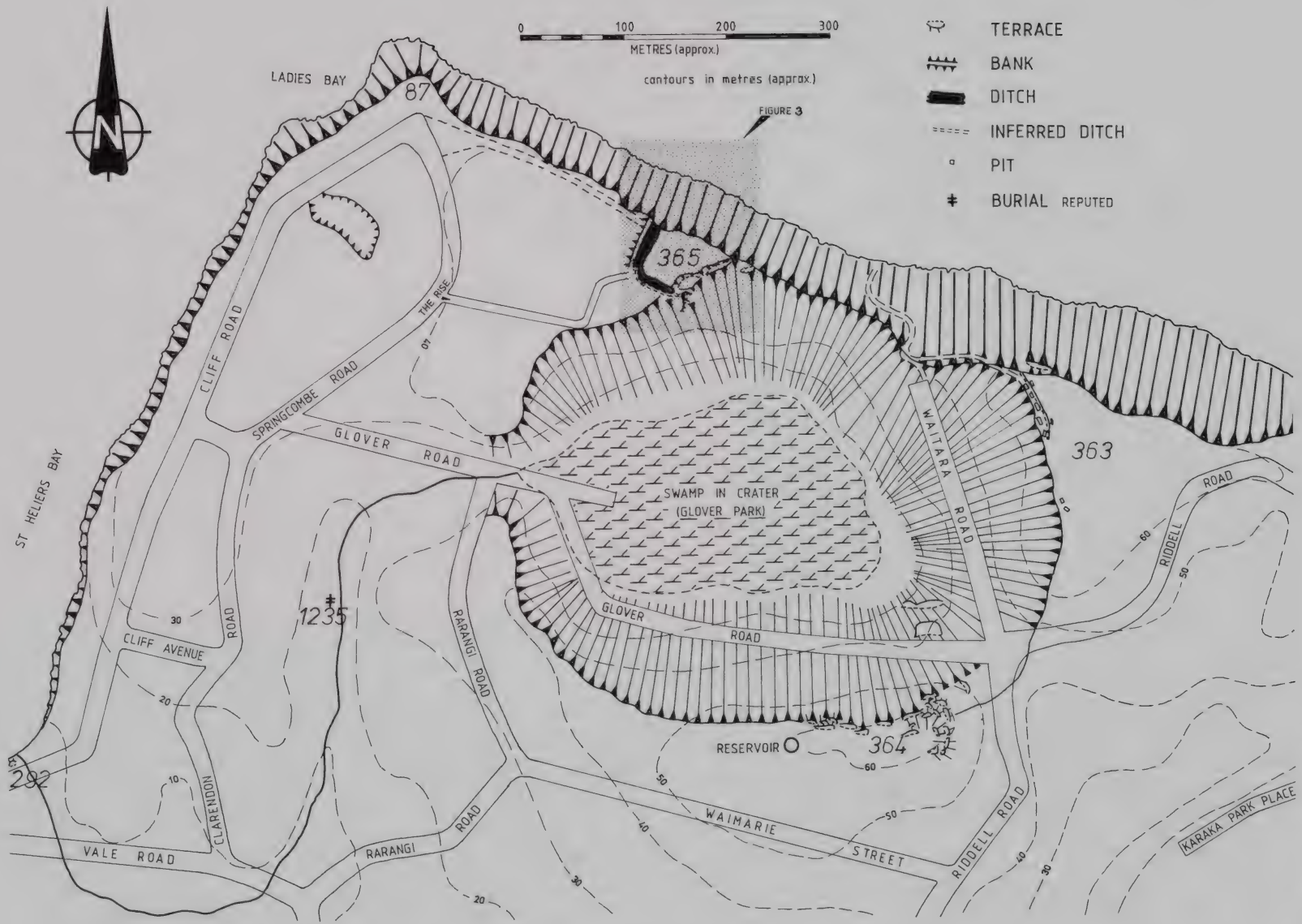


Fig.2. Sites in the vicinity of St. Heliers Crater, Auckland (compiled by C.A. Phillips).

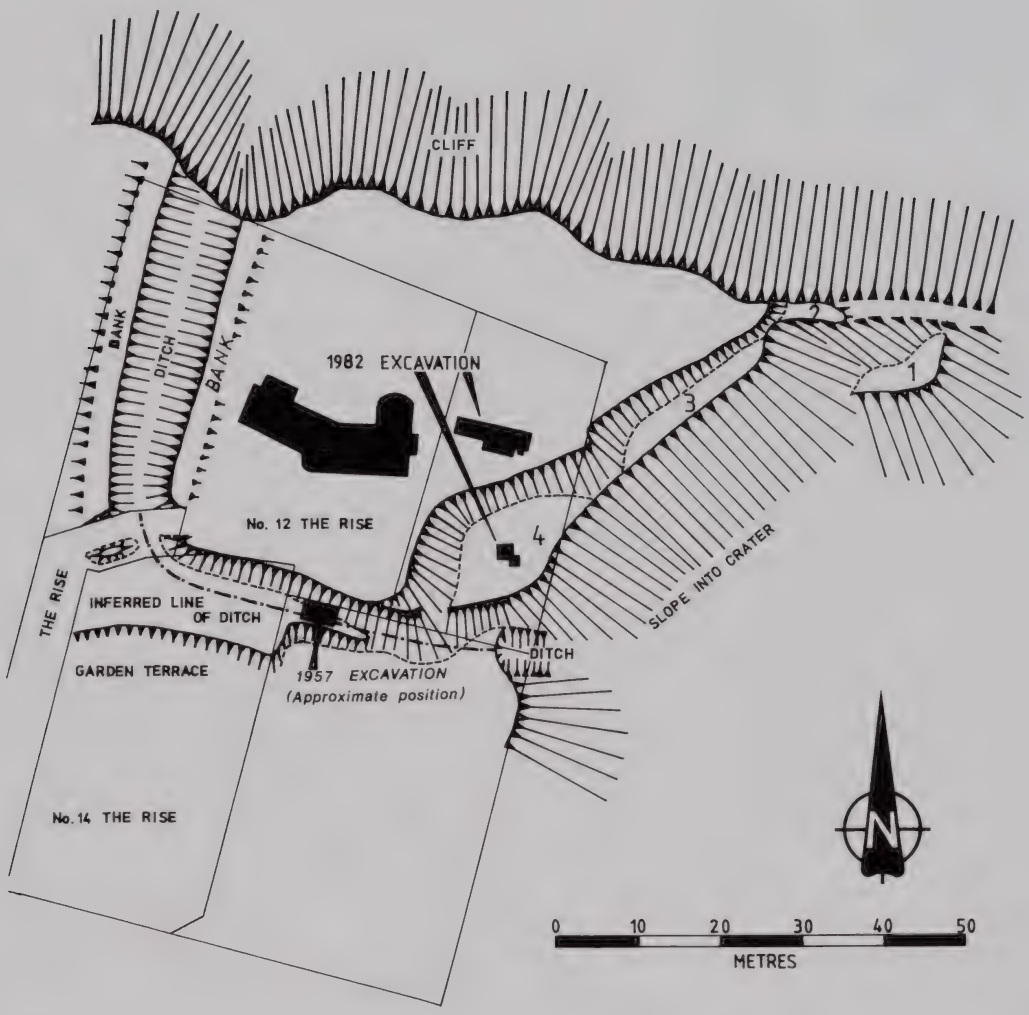


Fig.3. Te Pane o Horoiwi — platform of the citadel with location of the 1982 excavation (after map of L. Diamond).

The aim of the present investigation was to aid in the reconstruction of the sequence of occupation of this part of the Auckland isthmus. It was also hoped that excavation of a portion of the citadel would add to the present information as to the construction of this type of fortification. Material from this excavation has been lodged in the Auckland Institute and Museum.

MAORI TRADITION

Traditional Tainui history connects the initial naming and settlement of the land at the mouth of the Tamaki River to chiefs on board the Tainui canoe (Kelly 1949:52). There is considerable uncertainty over the names of sites at the entrance to the Tamaki River. A detailed analysis of the traditional material can be found in a report to the

New Zealand Historic Places Trust (Sewell 1984). Briefly the locality of site N42/365 appears to have been referred to by a number of names including Taurere and Whakamuhu. However Te Pane o Horoiwi is a name that has only been used to refer to N32/365, hence its name in this paper. There are no published accounts of a pa on this headland by the Ngati Whatua people and it is possible that it was occupied prior to settlement of the isthmus by these people. However, early ethnographic accounts do refer to people living at or near the entrance to the Tamaki River (Cruise 1974, D'Urville in Holloway 1962). Cruise (1974:213) recorded in his journal of 1820 that the *Dromedary* anchored between Motukoria and the mainland and that crew members visited some villages on shore "where we were met by a great number of natives". These reports suggest that in the 1820s the entrance to the Tamaki River was well populated although the exact location of settlements is not known.

THE LANDSCAPE

Te Pane o Horoiwi lies on the margin of the Waitemata strata that forms the high ground of the Auckland isthmus. The St Heliers crater was formed by a single explosive eruption forming a crater and tuff ring on the present coastline. The volcano has suffered greatly from erosion, waves having eroded the seaward flank of the cone and exposed the crater, and surface erosion washing away most of the remaining tuff deposit (Searle 1981:135). Remains of the tuff ring are visible to the south and east of the crater. The soil on the terraces (N42/364) on the southern slopes of the crater consists of brown friable volcanic derived loams.

The citadel platform of Te Pane o Horoiwi forms the boundary of the Waitemata sediment and the edge of the tuff ring of the St Heliers crater. In the area excavated there was no volcanic tuff, Waitemata sediment lay immediately beneath the topsoil (or at least beneath the cultural layers).

The choice of the St Heliers headland for a fortified site was possibly influenced by its strategic position. As a lookout the headland commanded views of the Rangitoto Channel and Tamaki Strait, close to a beach with safe landing for canoes. The shellfish species present in the midden indicate that the local foreshore was extensively exploited. The occurrence of terraces with midden incorporated into the brown friable loams suggests these may have been used for horticultural purposes. Evidence from another cone pa in the Auckland area indicates that extensive cultivations existed on the volcanic soils surrounding the cones with considerable habitations (reflected by shell midden and evidence of structures) among the gardens (Davidson 1978:6). It is likely, therefore, that occupation of Te Pane o Horoiwi, being a cone pa as well as a headland pa, followed similar lines.

THE SITE

The citadel of Te Pane o Horoiwi is situated on the north-western rim of the St Heliers crater and consists of a level platform of 2500 m^2. Some 50 m above sea level, this platform stands above all other features and is surrounded on two sides by natural cliffs, with earth work defences on the remaining sides (Fig.3). There were four terraces visible on the south-eastern slopes in 1978 as indicated in the Diamond map

from which Fig.3 is taken. Terraces 1 and 2 on Fig.3 were no longer visible in 1982. Terraces 1-4, consisting of artificially levelled areas rising by way of a scarp to the upper platform, could have been defended by palisading during occupation of the pa and could have formed part of the defences.

A defensive ditch was present originally along its western and southern sides (as indicated in Fig.3). The western portion of the ditch still extant contains the remnants of an inner bank. In 1978 Fox and Diamond noted an outer bank to the ditch (Fig.3). When the site was revisited in 1982 the remains of the outer bank were no longer visible. An 1899 photograph of the headland (Fig.4) shows the ditch on the southern slopes clearly visible. Much of the southern portion of the ditch was destroyed by housing development (discussion with local residents). The remaining portion of the southern ditch which was visible in 1978 has since been destroyed.

EUROPEAN MODIFICATION

The elevated portion of the tuff ring on which the citadel of Te Pane o Horoiwi is situated has been extensively modified in the past 50 years through the formation of private roads, the building of dwellings and landscaping for gardens. The swamp in the explosion crater of the volcano was developed into a public park which has necessitated considerable earthmoving. In addition some natural erosion has occurred in the form of crumbling away of the cliff edge.

Fig.4. Te Pane o Horoiwi from the east in 1899. Photo: H. Boscawen (Auckland Institute & Museum).

THE EXCAVATION

Excavation on Te Pane o Horoiwi consisted of a trench on the platform and a small area on Terrace 4, the locations of which are shown on Fig.3. A trench 10 x 2 m, aligned east to west, was opened up on the platform. As excavation progressed it was further extended towards the south. An area of 2.75 m^2 was excavated on Terrace 4. A total of 27.25 m^2 was excavated.

The turf and about 50 mm of topsoil and modern garden soil below it were removed by spade. Trowels were used for the remainder of the excavation with the exception of the extreme south-eastern corner of the trench which was spaded out. This latter area consisted of a build-up of midden with clay and European rubbish which had been placed on the edge of the south-eastern slope over the last 50 years.

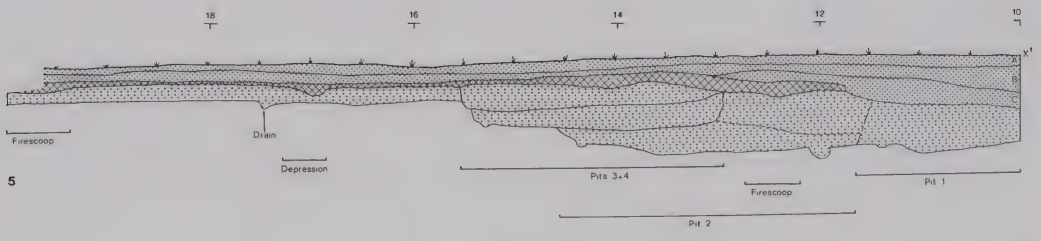
The trench on the Platform

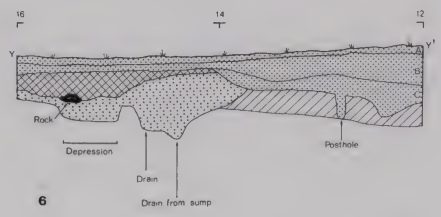
Although only a small area on the upper platform was excavated, the stratigraphy indicated repeated use of the platform and demonstrated several major changes in the character of occupation. Figs.5 and 6 of the northern and southern cross-sections show the deposition of layers. The stratigraphy was as follows.

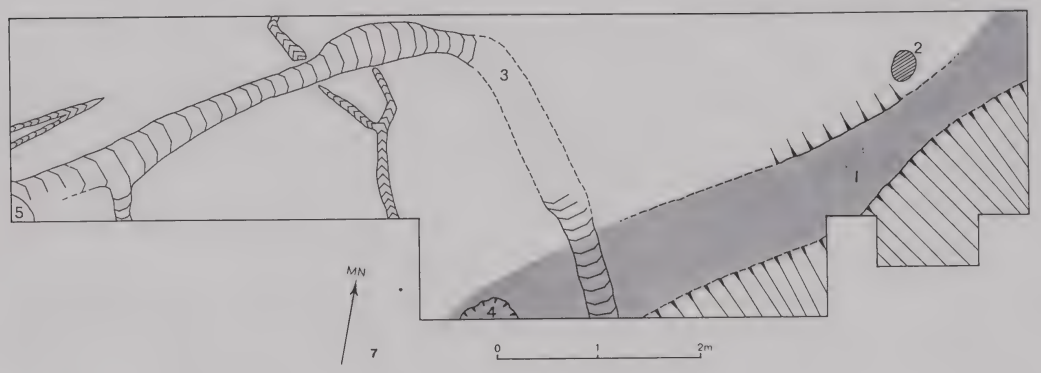
Layer 1. Turf zone and topsoil, up to 700 mm in depth.
2. Midden layer varying in depth from 50-150 mm. This layer covered the excavated area with the exception of the eastern portion of the trench where it was cut by modern disturbance.
3. Redeposited weathered Waitemata sediment varying from 200-800 mm in depth.
4. Natural — weathered Waitemata sediment (a yellow-orange clay-like deposit).

Excavation revealed several periods of activity during the Maori occupation of the platform. These periods of activity can be interpreted as the building of structures followed by in-filling and levelling of the living area prior to construction of further structures. As there were no trapped A or B soil horizons between the majority of these periods it is likely that one period followed the previous one over a relatively short time span.

The earliest activity consisted of the construction of defensive works. The platform was naturally protected by cliffs on the northern side and there was a defensive ditch on the western and southern sides. The eastern side had a more gradual natural slope. The earliest activity consisted of the building up of the natural scarp to the south-east by the addition of material, thus forming a bank and increasing the height of the scarp by 600 mm. It is likely that the natural slope was also steepened at the same time (although this was not revealed on excavation) and the material removed was used to form the bank.







Drain

Posthole

2 Feature number

Area covered by bank

A — Topsoil
B — 1970 fill
C — 1930 fill

Midden

Layer 3

Layer 4 bank fill

Figs.5-7. Excavation on the Platform. 5. Northern Cross-section at N6. Section x - x^{1}. 6. Southern Cross-section at N3. Section y - y^{1}. 7. Ground plan showing features from first and second periods of activity.

The bank and a posthole was associated with Period 1 (Fig.7). The bank (Feature 1) was composed of three layers: a hard capping of weathered Waitemata sediment, a layer of brown soil 220 mm in depth, and a layer of weathered Waitemata sediment which measured 350 mm at its greatest depth.

A posthole (Feature 2) is the earliest feature from Period 1 and only became noticeable at a depth of 900 mm from the surface. It was 950 mm deep, 710 mm of which were cut into the natural layer below the bank at an angle of 40-50°.

There were three features associated with the second period of activity (Fig.7). These features were constructed following disuse of the defensive features of Period 1.

A drain complex (Feature 3) covered the western half of the excavated area, truncating the bank. The depth of the drains ranged from 50-100 mm. The central portion of the main drain was truncated by the construction of a pit from Period 3. The levelling of the platform prior to occupation in Period 3 resulted in the entire area being covered with redeposited Waitemata sediment. It is probable that the drains running at an angle to the main drain were originally connected to it. The purpose of the drain complex would have been to remove excess surface water by diverting it to the edge of the southern scarp, possibly relating to a structure beyond the extent of this excavation.

Feature 4 was a depression 250 mm deep filled with light brown soil with flecks of charcoal. A second depression (Feature 5) containing a concentration of charcoal, could have been a small firescoop.

Following occupation in Period 2 the area of the platform to the interior of the bank was filled in, almost to the top of the bank. This action brought the living floor in Period 3 to the top of the bank.

In the portion of the platform excavated the majority of the features relating to Period 3 were concerned with the storage of food. Excavation revealed a sequence of four superimposed pits (Fig.8). The features from Period 3 were as follows.

Pit 1 is probably the earliest pit from this period although the digging of later features resulted in very little of its outline remaining. In the base of the pit alongside the western and southern walls was a small drainage channel 50 mm wide and 30-40 mm deep. Fill consisted of brown soil mixed with redeposited Waitemata sediment.

Pit 2 was a flat-based pit with a drain 50 mm wide and 50-100 mm deep in the floor close to the walls. The southern wall sloped out slightly from the base of the pit. In the floor was a posthole, 220 mm in diameter, cut into the natural Waitemata sediment to a depth of approximately 150 mm suggesting the pit was roofed. The pit was filled with up to 250 mm of brown soil. The remainder of the fill was similar to the fill of Pit 1.

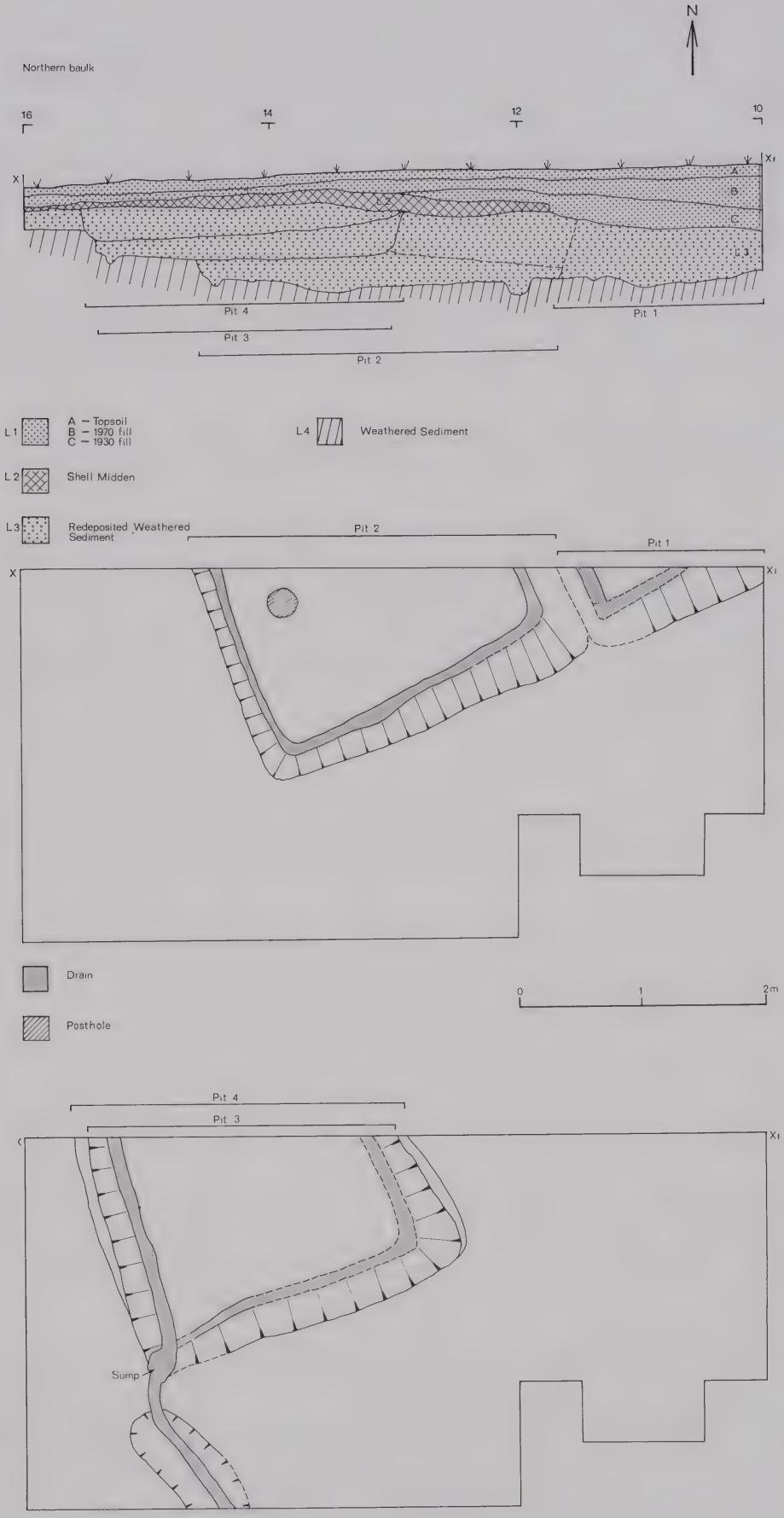


Fig.8. Excavation on the Platform. Ground plans and cross-section of pits in third period of activity.

Pit 3 was of similar dimensions and alignment to Pit 2, approximately 1 m further to the west. Floor drains were present alongside the western and part of the southern walls. In the south-western corner the floor drains led into a sump hole dug through the redeposited Waitemata sediment. Leading out of the sump was a further drain sloping towards the edge of the southern scarp.

Pit 4 was of similar dimensions and alignment to Pit 3. During excavation the outline of this pit was often difficult to follow, primarily due to the similar nature of both the deposit into which the pits were dug and the pit fills. However parts of the southern and eastern walls of this pit were traced and it is clearly visible in the northern cross-section (Fig.5).

The evidence from Period 3 suggests repeated use of this portion of the upper platform for storage. Each pit was filled prior to the digging of the next pit. This policy resulted in the platform remaining level with the top of the bank from Period 1. The evidence suggests features from Period 4 were constructed soon after the infilling of the final pit. During use of pits from Period 3 no features were constructed in the western portion of the area excavated.

The features from the fourth period of activity were all dug into the shell midden — Layer 2. It is postulated that, following the third period of activity, a large quantity of shell was spread over the entire area in order to form a living floor. This layer consisted predominently of broken cockle shells within an ashy matrix which also contained some sand and sandstone pieces.

Features from Period 4 were dug through, and the majority filled with, midden. Thirty features relate to this period of activity (Fig.9). Postholes from this period can be considered in three groups.

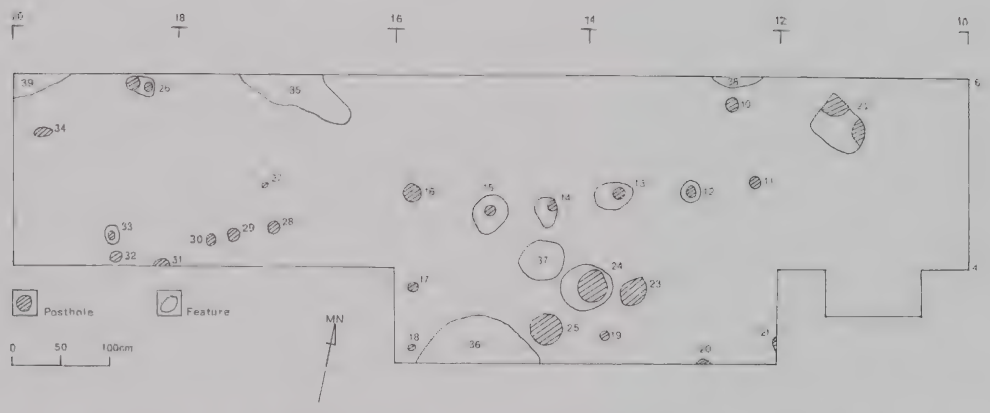


Fig.9. Excavation on the Platform. Ground plan of features from fourth period of activity.

1. Those relating to a single structure (Features 26-34), possibly a house or other building, in the western portion of the excavated area.
2. Those concerned with primary defence on the edge of the platform, i.e. palisade posts (Features 22-25).
3. A third group of postholes (Features 10-21). Features 11-16 were of similar depth and size. All these features were filled with midden from Layer 2.

Excavation on Terrace 4

On Terrace 4, 2.75 m² was excavated in order to determine whether defensive works occurred in this area as well as on the upper platform (Fig.3). Stratigraphy was as follows.

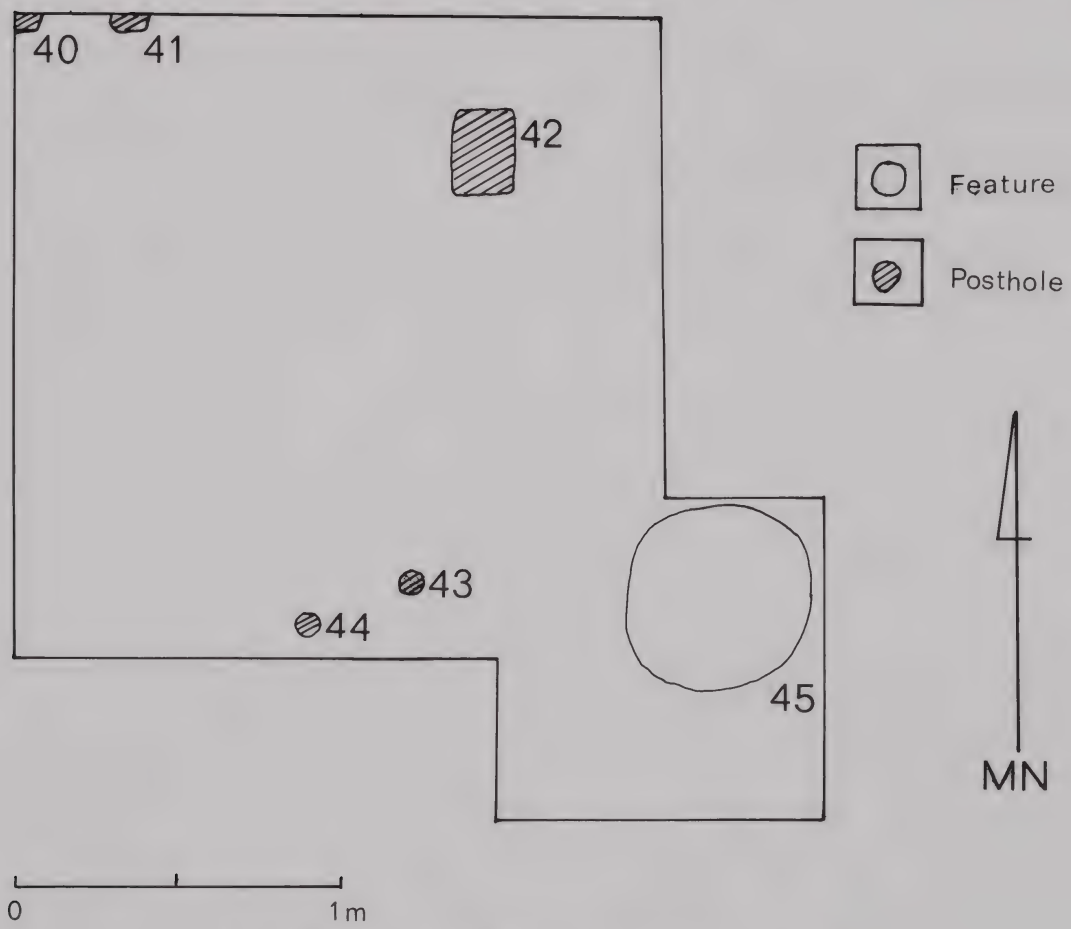


Fig.10. Excavation on Terrace 4. Ground plan of features.

Layer 1. Topsoil and European midden, including nails, glass, pottery, tins, etc., mixed with shell midden in a very disturbed state.
2. Predominantly prehistoric shell midden but some intrusion of European rubbish.
3. Dark brown soil with a scattering of midden.
4. Natural — weathered Waitemata sediment.

Excavation revealed six features (Fig.10). Features 40-44 were postholes or stakeholes, all probably relating to a structure of recent historic origin. Feature 45 was a scoop 600 mm in diameter, cut into Layer 4. All features were filled with shell midden.

Midden was not analysed from Terrace 4. One obsidian flake and two sandstone pieces were found within Layer 2 on Terrace 4.

MIDDEN ANALYSIS FROM EXCAVATION ON PLATFORM

The midden material analysed represents deposits associated with Period 4 only. Column samples covering 3.5m^2 on the platform and a grab sample (approximately one quarter of Feature 45) were taken.

The shellfish content of the midden was overwhelmingly of the soft shore species, mostly small cockle and pipi — see Table 1.

Table 1. Percentages of total shells analyses.

Species	Percentage of total
Chione stutchburyi (cockle)	66.1
Paphies australis (pipi)	24.2
Turbo smaragdus (cat's eye)	7.2
Cominella adspersa	.1
Cominella glandimormis	.1
Perna canaliculus (mussel)	.7
Pecten novaezelandiae (scallop)	.2
Ostrea lutaria (oyster)	.1
Melagraphia aethiops	.1
Miscellaneous incidental shells	1.0

The species are typical of the shellfish population present at adjacent beaches to this site and it is likely that all shellfish in the midden were collected from the immediate vicinity.

A sample of bone from Layer 2 revealed that *Chrysophrys auratus* (snapper) and *Dasyatis brevicaudatus* (stingray) were present; sheep, cow and pig bones were in samples from small European rubbish dumps uncovered during excavation. Dog, ray and small quantities of *Phocarctus hookeri* (sealion) bones were also recovered.

LITHIC ANALYSIS OF MATERIAL FROM PLATFORM

A total of 275 stones pieces were retrieved from the platform. Material recovered from Layer 1 on the platform was from the easternmost portion of the area excavated where midden, including stone flakes, had been incorporated with the fill used to extend the garden in recent years; thus it derived from an earlier layer elsewhere on the site (Table 2).

Table 2. Identification of stone pieces by layer.

Stone type	Excavation on Platform			Total
	Layer 1	Layer 2	Layer 3	
Greywacke	14	45	152	211
Sandy greywacke	1	7		8
Sandstone	1	1	7	9
Quartzite	1			1
Local volcanic	3			3
Scoria		3	8	11
Jasper		1		1
Obsidian	5	9	12	26
Hematite		2	3	5
				275

Greywacke accounts for 76% of the stone material. This rock is available from several sources in the Auckland area, the nearest to the site being Motutapu Island or Waiheke Island. Waitemata sandstone is readily available on this part of the coast. Five pieces of menatite-rich rock (red ochre) were also retrieved. These rocks were classified as such by P. Black (pers.comm.) and it is likely that the red colouring derived from them was as effective as a colouring agent as hematite clay. Table 3 sets out the breakdown of used stone pieces into various categories by layer.

Table 3. Used stone pieces by layer.

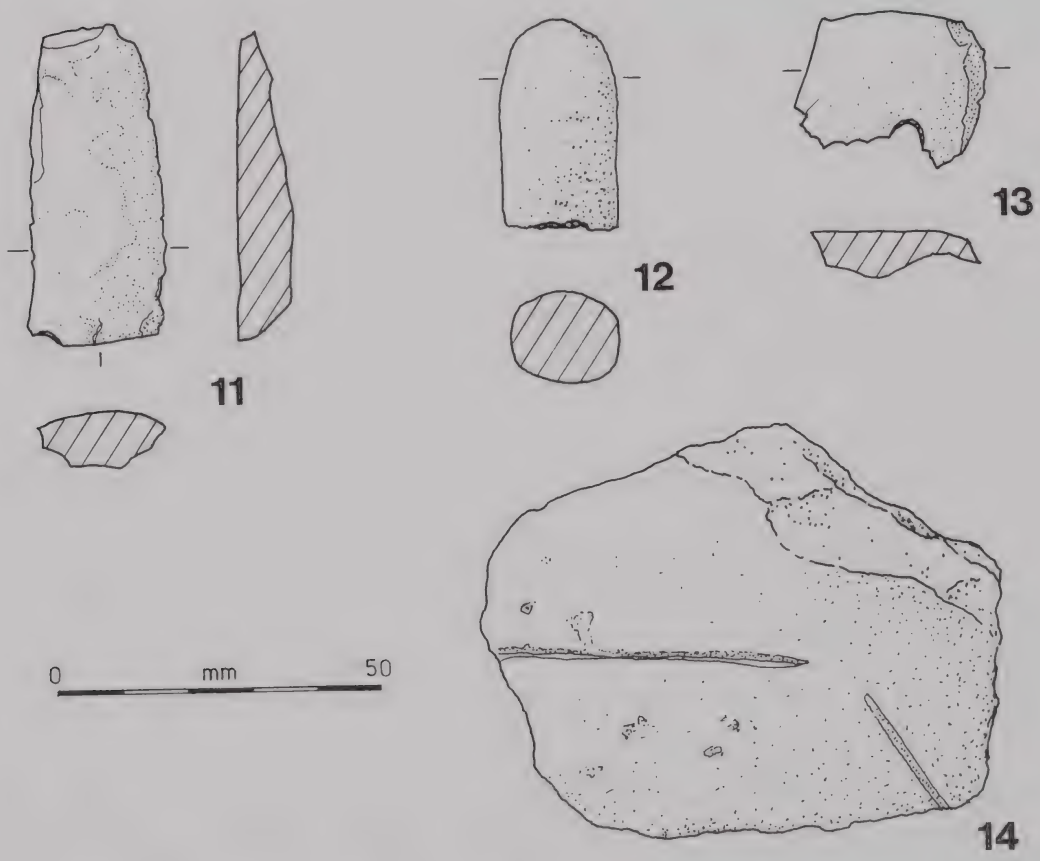
Layer	Artefact	Hematite-rich rock	Polished greywacke flake	Obsidian with used edge	Greywacke flake with used edge
1	—	—	3	1	1
2	Grooved sandstone Sandstone file				
3	Chisel	4	3	4	11

The end of a sandstone file (Fig.12) and a piece of sandstone with a groove 1 mm wide and 43 mm long (Fig.14) were recovered from Layer 2. From Layer 3 in the fill of Pit 3, a chisel of greywacke was retrieved (Fig.11). This chisel was complete and was 50 x 22 x 8 mm, with a rectangular cross-section. The chisel had been shaped by flaking

and there was no evidence of hammer dressing; it was partially polished on the front, the back and the blade. The cutting edge of the blade was very blunt, with one large flake removed which suggests that it may have been broken in use.

A total of 27 pieces of obsidian was excavated with use-wear on seven flakes (26% of the obsidian assemblage). Three pieces of obsidian were of a green colour and two a red-brown colour, as observed in transmitted light; the remainder were grey. It is probable that the green obsidian came from Kaeo area (R. Brassey, pers. comm.). Many grey obsidian pieces contained a weathered outer cortex with a combed appearance which probably originated from a detrital deposit (R. Brassey, pers. comm.). Such deposits occur at Kaeo, Great Barrier Island and Cooks Bay (Ward 1973:95). Red-brown obsidian is found in the central North Island and also in Northland and on the east coast of the Coromandel Peninsula (Ward 1973:99).

Edge damage on all the used obsidian flakes was unifacial, in keeping with the majority of obsidian assemblages from New Zealand. This is interpreted as being caused through a scraping action (Moorwood 1974:12).



Figs.11-14. Artefacts from Te Pane o Horoiwi. 11. Chisel. 12. File. 13. Flake. 14. Sandstone with groove.

A total of 211 pieces of greywacke was recovered. Use-wear was visible on 12 flakes. The damage on 5 of the used flakes consisted of a very concave and blunted working edge (one of which is illustrated as Fig.13) suggesting that all may have been used for the same purpose, which could have been the whittling of small sticks. The analysis of use wear on the obsidian and greywacke assemblage is set out in detail in Sewell (1984).

While use-wear was recorded on only 12 greywacke flakes it is possible that a much higher proportion of the flakes were used and the tasks to which they were put resulted in little visible damage to the used edges. Davidson (1970a:51) in discussing the analysis of use-wear on greywacke flakes from N38/37 on Motutapu Island said "experimentation showed that flakes could be used for cutting soft material without leaving visible sign of use on the edge suggesting that most flakes could have been used for purposes such as food preparation and that only those employed in working harder material show visible signs of use."

DISCUSSION AND CONCLUSIONS

The majority of excavations on Auckland's volcanic cones have taken the form of salvage excavations — to learn something of the construction of the defences prior to destruction by quarrying, reservoir installation and the like. To date only a limited number of such excavations have been fully reported. This makes comparison difficult between the defences on Te Pane o Horoiwi and those of other cone pa.

Excavations on Mount Wellington, Mount Roskill, Taylor's Hill, One Tree Hill, Wiri Mountain and Ellett's Mountain have revealed a complex sequence of occupation, including levelling and terracing, digging and redigging of storage pits and fortifications reflecting several hundred years of occupation and modification rather than a single construction phase (Davidson 1982:36). The excavations at Te Pane o Horoiwi indicate that occupation was similarly complex.

Fortifications of Auckland's cone pa are diverse, some with substantial earthworks and others with none. The strongpoints of Mount Hobson, Mount Wellington, One Tree Hill and Mount St. John were relatively small and were defended by a transverse ditch in each case. Excavation of a portion of the summit of Mount Roskill showed that the citadel was defended by a double row of palisades (Fox 1980:48) and palisades were also present on some of the large lateral terraces on One Tree Hill (Bulmer, pers. comm.). Excavations on Mount Wellington suggest that only a small portion of the summit was defended; the lower terraces on that cone and on Taylor's Hill contained no evidence of palisading (Davidson 1982:38).

Although investigations of the strongpoints of Auckland cone pa are few, forms of defence chosen for each cone were those most suited to the landform of that particular cone. The ditch surrounding two sides of the citadel of Te Pane o Horoiwi may have been extensive in terms of labour involved but, as Davidson (1982:38) has suggested, the lack of sufficiently large trees to be used as palisade posts may have resulted in the digging of ditches being a more economic proposition.

The lack of palisading on Terrace 4 is similar to results from Mount Wellington and Taylor's Hill where no palisades were found on lower terraces. It is likely, therefore, at least in these cases, that only a small portion of the cone was fortified and, as Davidson (1978:6) suggests, the concept of a cone pa with palisading on every terrace may well be erroneous.

The defences of the citadel of Te Pane o Horoiwi consisted of ditches and banks with natural cliffs on three sides; the fourth side was defended by a row of palisades on top of a bank and associated artificially steepened scarp. The sides of the palisade posthole from the first period of activity were not parallel, suggesting that the hole was dug at a sloping angle to allow the post to be slid in place, packed around with sandstone pieces, then brought up to a more perpendicular angle. This method of erecting heavy posts is illustrated in Best (1975:82). The bank was then constructed around the *in situ* palisade post. Such construction would hold the post firmly in position and minimise the risk of its being pulled out during attack by the enemy. The erection of palisade posts in this manner is recorded by Fox at Te Awanga, Hawkes Bay (Fox 1978:12). Bulmer (1983:45) also reported on the digging of palisade postholes prior to construction of a defensive bank at Waitete. Doubtless other posts of similar construction and purpose existed beyond the bounds of this excavation, possibly along the whole of the eastern edge of the platform. The construction of the bank was similar to the defences excavated at Maiore (Fox & Green 1982:76) where the natural slopes were steepened by scarping and the soil obtained heaped up around the base of the palisade. In the area with least natural defences at Maiore soil was quarried from the foot of the scarp to make a higher bank across the ridge.

Comparison of the pits from the third period of activity at Te Pane o Horoiwi with pits dug into clay or clay-like substrata on other cone sites in the Auckland area indicates similarity in construction — e.g. N38/30 (Leahy 1970, 1972), N38/37 (Davidson 1970a), N42/137 (Davidson 1970b) and N42/114 (Law 1970). Law commented (1970:98) that the sump-like feature excavated at N42/114 (Alberon Park) did not readily allow water infiltration, rather collection. The sump and exit drain in Pit 3 would have effectively facilitated water removal. The exit drain was in the form of a tunnel, of similar construction to those at Hamlin's Hill (Nichol 1980:216). Marks of digging sticks used to construct the sump and associated drain were clearly visible. Within the sump itself was a considerable quantity of hematite-rich clay. Law (1970:97) reported the presence of red ochre in each of the pits excavated at Alberon Park. The reason for the presence of red ochre in these pits is unknown.

Faunal material recovered is typical of inner harbour sites with a predominance of cockles and pipi. The presence of snapper and stingray suggests the fishing activities of Te Pane o Horoiwi were similar to other sites in the Auckland area. Sealion bone from Layer 2 is interesting. While all early sites in the Auckland area have small quantities of seal and sealion no such bones have yet been recorded from later sites (I.Smith, pers. comm.). However as there have been no detailed studies of the economy of the people who lived on Auckland's cone pa this in itself may not be unusual or indicative of an early date.

Four periods of activity were revealed which demonstrated that there had been several major changes in the character of occupation of the upper platform as set out in Table 4.

Table 4. Relationship between stratigraphic layers and periods of activity.

Layer	Period of activity
1A	European modification 1980s
1B	European modification 1970s
1C	European modification 1930s
2	Period 4 — postholes and firescoops
	Deposition of midden
3	Pits filled in with dark brown soil mixed with redeposited Waitemata sediment
	Period 3 — suggestion of pits dug into redeposited weathered Waitemata sediment
	Area filled with redeposited weathered Waitemata sediment and levelled to top of the bank
	Period 2 — drain complex
	Period 1 — defensive bank and associated palisade post constructed
4	Natural sub-strata — weathered Waitemata sediment

During the first period of activity emphasis was centred on defence of the citadel. An artificially steepened scarp and an earth bank were constructed on the side of the citadel not defended by natural cliffs or by a ditch and bank. The one palisade posthole excavated from this period of activity indicated that firstly the post was dug into position and the bank was then constructed around the erected post.

The citadel was apparently undefended during the second period of activity. The main feature from this period was a large drain which breached the defensive wall. It is likely that the drain complex related to a structure or structures beyond the bounds of the excavation.

During the third period, activity was concerned with the construction of food storage pits and not with defence. The features from the final period of activity were dug into a living floor of compacted shell midden. Emphasis was again centred on defence of the citadel. The alignment of postholes within the defended area suggests that a house or small structure was also constructed.

Lack of traditional knowledge of occupation of this pa by the Ngati Whatua would appear to indicate a date for termination of occupation prior to the mid-eighteenth century, suggesting that the pa was a Waiohua fortification.

Acknowledgments. I wish to thank property owners Mrs. Carew and Mrs. McAlpine for help and interest; Dr. Toan of Beca Carter Hollings and Ferner Ltd. for advice and identification of soils; David Simmons for information on traditional history of the area; Lady Fox for her initial interest in this pa and for making available Fig.3.

Dr. Susan Bulmer, NZ Historic Places Trust Regional Archaeologist, supervised the initial organisation of the excavation and thanks are extended to her and to Lady Fox for their continued support and encouragement during excavation and report writing.

Bone material was examined and identified by Dr. I. Smith and R. Nichol, University of Auckland. The counting and analysis of lithic material was carried out by J. Goodwin and J. Maingay, with advice on rock types and sourcing by Associate Professor P. Black and R. Brassey, and analysis of midden material by J. Gardiner, all of University of Auckland.

I also wish to record my thanks to all the excavators, both full-time and volunteers. Finally, thanks are extended to J. Mihilavic who helped draw Figs. 1-3, S. Maingay for Figs. 4-10, and to C. Phillips for Fig. 11 and advice on all illustrations.

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THE TAXONOMY OF SOME INDO-PACIFIC MOLLUSCA
PART 13. WITH DESCRIPTION OF A NEW SPECIES

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Abstract. New geographical range extensions are recorded for *Neothais rugulosa* (Pease), *Engina mactanensis* Cernohorsky, *Peculator verconis* Iredale, *Oliva buelowi* Sowerby, and *Anachis clathrata* (Brazier) [nom. praeocc.]. *Nassarius* (*Plicarcularia*) *gibbosulus* (Linnaeus) and *N.* (*P.*) *circumcinctus* (A.Adams), are recognized as valid species occuring sympatrically in Turkey. *Vexillum* (*Costellaria*) *martinorum* from the Philippines is described as a new species and *Mitra japonica* A.Adams, is elucidated on the basis of a lectotype designation.

Family MURICIDAE

Genus **Neothais** Iredale, 1912

Neothais Iredale, 1912, Proc.Malac.Soc.Lond. 10:223. Type species by OD *Purpura smithi* Brazier, 1889. Recent, S.W. Pacific.

Neothais rugulosa (Pease, 1868) (Figs.1-3)

1868. *Sistrum rugulosum* Pease, Americ. J. Conch. 4(3)93, pl.11, fig.7.
1880. *Ricinula* (*Sistrum*) *chaidea* Duclos (pars), Tryon, Man. Conch. 2:187, pl.58, fig.247 only (non *Purpura chaidea* Duclos, 1832).

TYPE LOCALITY. Howland Is, Pacific Ocean.

Type specimens. No longer extant. The illustrated specimen from Pease (1868), pl.11, fig.7, given dimensions length 8.0 mm, width 5.0 mm, is here designated as the illustrated lectotype of *N.rugulosa* (Pease) [Fig.1].

The species has not been reported on since being erroneously placed in synonymy of *Morula chaidea* (Duclos). A specimen matching Pease's lectotype has been collected at Lelepa landing, Efate I, Vanuatu, under coral in 3 - 4 m (*leg.* Dr R. Willan). The specimen is small, 8.0 mm in length, with 12 axial ribs and 2 spiral cords on the penultimate and 8 ribs and 5 cords on the body whorl and with additional rugose cords on the siphonal fasciole. The shell is white, aperture shining white, the columella is smooth and the outer lip is patulous and has 15 lirae in groups of 2-4. This appears to be a rare species with a Pacific distribution.

Family BUCCINIDAE

Genus **Engina** Gray, 1839

Engina Gray, 1839, Zool. Capt. Beechey's Voy. "Blossom", p.112. Type species by SD (Gray, 1847) *E.zonata* Gray, 1839 = *Purpura turbinella* Kiener, 1836. Recent, Caribbean.

Engina mactanensis Cernohorsky, 1985 (Fig.4)

1984. *Cantharus lanceola* Kuroda & Habe, Sharabati, Red Sea shells, pl.21, fig.10 (non *Enzinopsis lanceolata* Kuroda & Habe, 1971).
1985. *Engina mactanensis* Cernohorsky, Rec. Auckland Inst.Mus. 22:53, figs.11-16.

TYPE LOCALITY. Punta Engano, Mactan I, Cebu, Philippines.

Since the original description of the species from the Philippines (Cernohorsky 1985), I have examined specimens from near Rabaul, New Britain, Papua New Guinea, collected by Mr J. Beasley at diving depth. The species has also been recorded from the Red Sea by Sharabati (1984) under the name "*Enzinopsis lanceola*" (error for *lanceolata*). The true *Engina lanceolata* Kuroda & Habe, is considerably different to *E.mactanensis* and is more similar to *E.curtisiana* (E.A. Smith, 1884). Two specimens of *E.mactanensis* were also collected at Moen I, Truk lagoon, Caroline Is, in 2-4 m (R.Salisbury, in litt.), and the species appears to have a wide Indo-Pacific distribution.

Family COLUMBELLIDAE

Genus **Anachis** H. & A. Adams, 1853

Anachis H. & A. Adams, 1853, Gen.Rec.Moll. 1:184. Type species by SD (Tate, 1875) *Columbella scalarina* Sowerby, 1832. Recent, Mexico to Panama.

Anachis clathrata (Brazier, 1877) [nom. praeocc.] (Figs.5-8)

1877. *Columbella* (*Anachis*) *clathrata* Brazier, Proc.Linn.Soc. N.S.W., 1:229 (non Geinitz, 1874).
1883. *Columbella* (*Seminella*) *clathrata* Brazier, Tryon, Man. Conch. 5:173 (not illustrated).
1901. *Columbella clathrata* Brazier, Hedley, Rec.Austral.Mus.4(3):123, pl.16, fig.6 (illustrated syntype).

TYPE LOCALITY. Katow, Papua New Guinea, 7 fathoms (= 12.8 m).

Type specimens. The 12 syntypes of *C.* (*A.*) *clathrata* mentioned by Brazier (1877) are now on permanent loan in the Australian Museum, Sydney (formerly in the Macleay Museum, Sydney), No. A-85. The largest specimen, which is probably the one illustrated by Hedley (1901), measures length 6.8 mm, width 4.0 mm (Figs.5,6).

Specimens of *Anachis clathrata* have recently been recovered from weed on a salt water pump frame of the Queensland Alumina Ltd. at South Trees Inlet, Port Curtis, Queensland, Australia, in about 3 m depth (*leg.* N. Trevor, 1982). Fresh specimens are yellowish-brown in colour with a teleoconch of 3¾ whorls and a protoconch of 3½

Figs. 1-8. 1-3. *Neothais rugulosa* (Pease). 1. Type figure; 8.0 mm (from Pease 1868, pl.11, fig.7). 2,3. Specimen from Efate I, Vanuatu; 8.0 mm. 4. *Engina mactanensis* Cernohorsky. Rabaul, Papua New Guinea; 10.7 mm. 5-8. *Anachis clathrata* (Brazier) [nom.praeocc.]. 5,6. Syntype Austral.Mus.Sydney, No. A-85; 6.8 mm. 7,8. Specimen from Port Curtis, Qld., Australia; 7.0 mm.

smooth embryonic whorls, 20 axial ribs on the penultimate and the same number on the body whorl, a sutural row of nodules on whorls, 2-3 spiral cords on the penultimate and 9 spirals on body whorl + 8 basal cords, outer lip with 6-7 denticles, columella with 2-3 denticles (Figs.7,8).

Columbella clathrata Brazier, 1877, is a primary homonym of *Columbella clathrata* Geinitz, 1874, from Cenomanian, U. Cretaceous deposits of Saxony (Geinitz 1871-75:264). No substitute name is proposed here for the homonymous *C.clathrata* since *Columbella brevissima* Hervier, 1899, from Lifu, New Caledonia, could prove to be conspecific with *C.clathrata* Brazier.

Family NASSARIIDAE Iredale, 1916

[Validation of the family name is pending with ICNZ — No. Z.N.(S.) 1893]

Genus **Nassarius** Duméril, 1806

Nassarius Duméril, 1806, Zool. Analytique p.166. Type species by SM (Froriep, 1806) *Buccinum arcularia* Linnaeus, 1758. Recent, Indo-Pacific.

Subgenus **Plicarcularia** Thiele, 1929

Plicarcularia Thiele, 1929, Handb.syst.Weicht. 1:324. Type species by M *Nassa* (*Plicarcularia*) *thersites* (Bruguière) = *Buccinum pullus* Linnaeus, 1758. Recent, Indo-Pacific.

A comparison between N. (P.) gibbosulus (*Linnaeus*) *and* N. (P.) circumcinctus (*A. Adams*)

Nassarius (Plicarcularia) gibbosulus (Linnaeus, 1758) (Figs.9,10)

1758. *Buccinum gibbosulum* Linnaeus, Syst.Nat. ed.10:737.
1798. *Cassis callosa* Röding, Mus.Bolten. p.28.

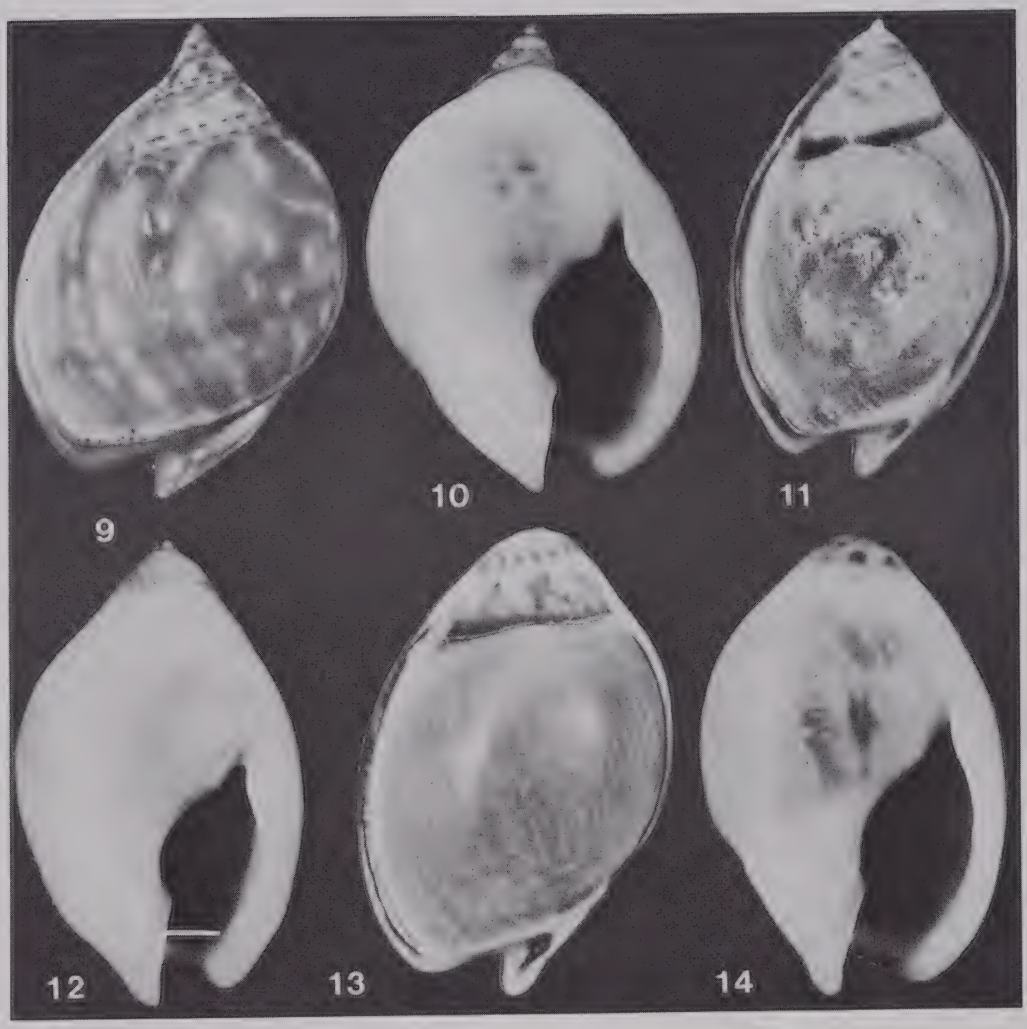
TYPE LOCALITY. Mediterranean Sea (*gibbosulus*); none (*callosa*).

Type specimens. A single type specimen of *N.* (*P.*) *gibbosulus* is in the Linnean collection, London.

Nassarius (Plicarcularia) circumcinctus (A.Adams, 1852) (Figs.11-14)

1852. *Nassa circumcincta* A.Adams, Proc.Zool.Soc.Lond. p.102.
1972. *Naytiopsis granum flammulata* Nordsieck, Arch.Moll. 102(4-6):238, textfig.39; 1975 Yaron, Conchiglie 11(1-2):34 (placed in synonymy of *N.circumcinctus* A.Adams) [non *Nassa flammulata* Preston, 1909; nec Schepman, 1911 = *Nassarius*].

TYPE LOCALITY. Red Sea (*circumcintus*); Shiqmona Bay, Israel (*flammulata*).



Figs. 9-14. 9,10. *Nassarius* (*Plicarcularia*) *gibbosulus* (Linnaeus). Kizkalesi, Turkey; 15.8 mm. 11-14. *N.* (*P.*) *circumcinctus* (A.Adams). 11,12. Lectotype B.M. (N.H.) No. 197322; 18.3 mm. 13,14. Specimen from Kizkalesi, Turkey; 12.5 mm.

Type specimens. Three syntypes of *N.* (*P.*) *circumcinctus* are in the British Museum (Nat.Hist.), London, No. 197322. The specimen measuring length 18.3 mm, width 9.8 mm, is here selected as the lectotype (Figs.11,12).

Kobelt (1878), Tomlin (1932), Nordsieck (1972) and other writers, placed *N.* (*P.*) *circumcinctus* in the synonymy of *N.gibbosulus.* Mienis (1980) commented on the reported occurrence of 39 specimens of *N.gibbosulus* and 10 specimens of *N.circumcinctus* from excavations of the royal Necropolis and the "Cellarka" tombs near Salamis, Cyprus, dating from the 6th to 4th century B.C. The author separated

the two species on features of a more slender shell, absence of a dorsal hump, truncated apex and different colour pattern in *N.circumcinctus*. The author also commented on the reported absence of *N.circumcinctus* in present day waters surrounding Cyprus, but mentioned that it was possible that both species still live today in Cyprus waters.

Specimens of both species were received from Kizkalesi, between Mersin and Silifke, Turkey, collected in 3-4 m on a sand substratum (*leg.* Mrs D. Schmidt, August 1985). *N.* (*P.*) *gibbosulus* was moderately uncommon but *N.* (*P.*) *circumcinctus* occurred in great numbers according to the collector and no intergrading specimens were found. *N.gibbosulus* is a slightly larger and broader species with more numerous conical spire whorls and a more distinct dorsal hump; the base colour is grey or greenish-brown, spotted or blotched with white or dark colours, spire whorls have 1-2 interrupted brown lines and the edge of the callus and the basal oblique cord are coloured orange to orange-brown. *N.* (*P.*) *circumcinctus* in comparison is slightly smaller, more elongate in form and compressed if viewed in profile, the dorsum has numerous, very fine axial growth-striae, the dorsal hump, when present, is more discreet, the spire whorls are fewer and shorter and the truncated apex has the embryonic whorls almost flat or they may terminate in a nipple; the base colour is a yellowish-brown with a darker brown overlay and some brown axial lines, the edge of the callus and the tip of the siphonal canal and body whorl suture are coloured dark brown and the spire whorls have small brown spots and short streaks. *N.* (*P.*) *gibbosulus* has a moderately broad and deep trough between the oblique dorsal basal cord and the tip of the siphonal canal, a feature which has not been seen in *N.* (*P.*) *circumcinctus*.

The type locality of "Red Sea" for *N.* (*P.*) *circumcinctus* is correct since the species has been introduced to the Red Sea from the Mediterranean. The species occurrence in Turkey and the Mediterranean side of Israel, would strongly indicate the species presence in the interposing island of Cyprus. The description of the homonymous *Naytiopsis granum flammulata* Nordsieck, 1972, from Israel, has been based on a small juvenile individual of *N.* (*P.*) *circumcinctus*.

Family COSTELLARIIDAE

Genus **Vexillum** Röding, 1798

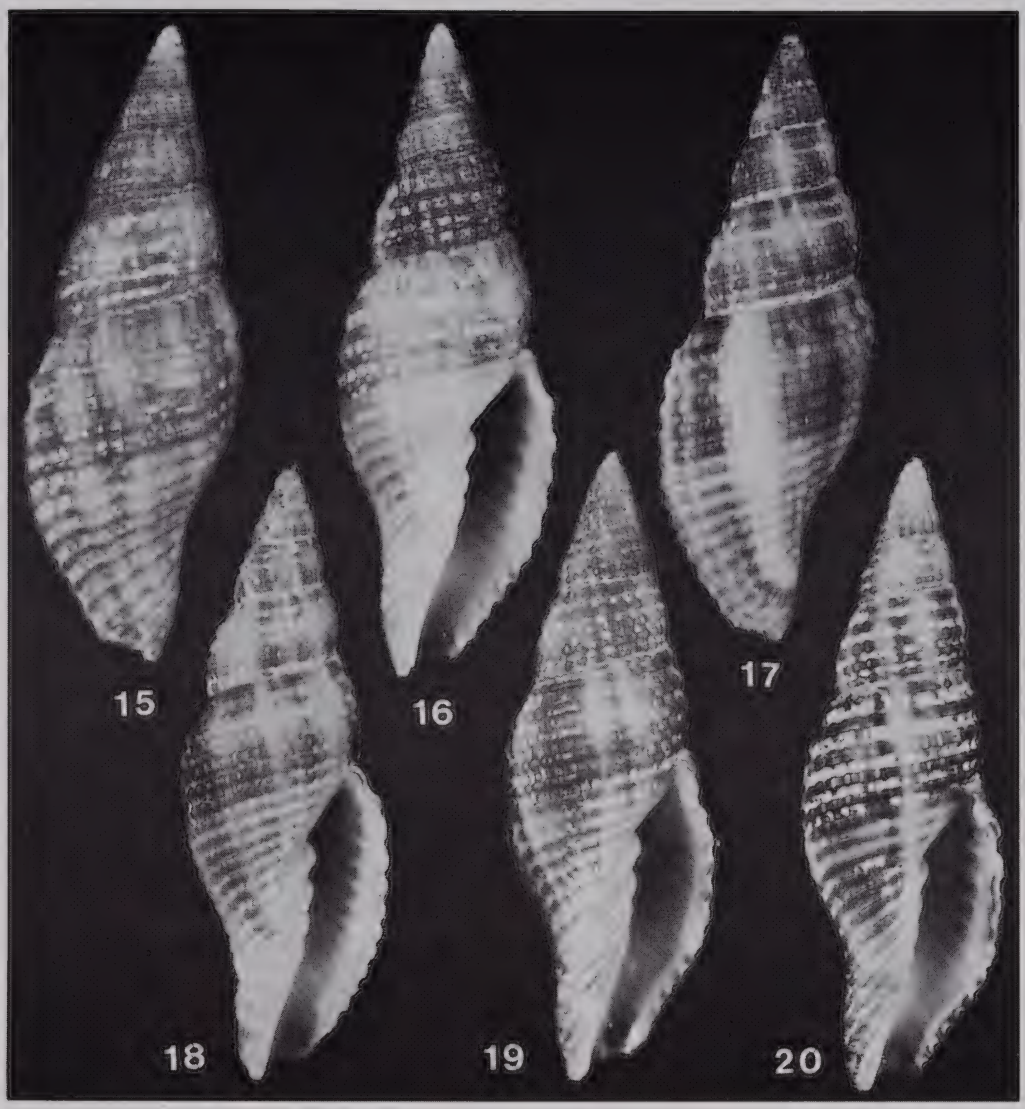
Vexillum Röding, 1798, Mus.Bolten., p.138. Type species by SD (Woodring, 1928) *V.plicatum* Röding, 1798 = *Voluta plicaria* Linnaeus, 1758. Recent, Indo-Pacific.

Subgenus **Costellaria** Swainson, 1840

Costellaria Swainson, 1840, Treat.Malac. pp.130, 320. Type species by M *Mitra rigida* Swainson, 1821 = *M.semifasciata* Lamarck, 1811. Recent, Indo-Pacific.

Vexillum (Costellaria) martinorum sp. n. (Figs. 15-20)

Shell moderately small in size, up to 23.3 mm in length, fusiformly-elongate, width 26%-34% of length, dull in appearance, teleoconch of 6½-7¼ convex whorls, protoconch of 3 translucent embryonic whorls, sutures distinct. Early mature whorls



Figs. 15-20. *Vexillum* (*Costellaria*) *martinorum* sp. n. 15,16. Holotype AIM No. TM-1372; 22.7 mm. 17-20. Paratypes from Coamen I, Philippines. 17,18. Length 20.1 mm. 19. Length 20.7 mm. 20. Length 19.0 mm.

granulose, later whorls sculptured with flattish elevated spiral cords which number from 5-6 on the penultimate and 11-14 on the body whorl; sutures with 1-2 cords which are usually separated by a wider interspace than succeeding spiral cords. Axial sculpture consists of axial lirae which connect laterally compressed nodules on spiral cords, axials numbering from 24-37 on the penultimate whorl. Aperture narrow, about equal in height to the spire, height 48%-53% of length, interior with 7-14 distinct lirae which are prominent in more mature specimens, outer lip moderately thin, convex, columella not calloused and with 4-5 (usually 5) slanting folds, siphonal

fasciole with 6-8 close-set cords. Reddish-brown in colour, ornamented with nebulous cream-coloured axial streaks, some individuals with a white central band on body whorl, aperture white to rosy-white, columella white. Remains of a pale straw-coloured periostracum embedded in interspaces of spiral cords.

TYPE LOCALITY. Off Coamen I, western Bohol reef, Philippines, 183 - 207 m.

DISTRIBUTION. Known only from the Philippines.

Holytype. In the Auckland Institute and Museum No. TM-1372, length 22.7 mm, width 7.5 mm, height of aperture 11.1 mm; penultimate whorl, as viewed from the ventral side, with an oblique damage scar (Figs.15,16).

Paratypes. Paratypes from the type locality in coll. R Martin, Cebu City, Philippines. A total of 15 specimens have been examined.

V. (*C.*) *martinorum* is most closely similar to *V.* (*C.*) *vandervlerki* (Koperberg, 1931) from the Pliocene of Timor and also known living in deep water in the Philippines. The latter species, although also distinctly nodulose, has flat-sided whorls, more distinct axial ribs, very narrow interspaces between spiral cords which also lack axial lirae, and columellar folds which extend onto the siphonal canal. *V.* (*C.*) *vandervlerki* is also larger and is uniformly creamy-white under a brown periostracum.

The species is named for Mr & Mrs R. Martin, Cebu City, Philippines, whose diligent dredging operations in the Bohol Strait discovered not only this, but other noteworthy species.

"Mitra japonica" A.Adams, 1864 (Figs.21,22)

1864. *Mitra japonica* A.Adams, J.Linn.Soc.Lond. 7:198; 1970 Cernohorsky, Bull.Auckland Inst.Mus. 8:35; 1985 Habe, Spec.Publ.Mukaishima Mar.Biol.Stat. No.232:10, pl.2, fig.2.

TYPE LOCALITY. Kino-o-Sima, Japan.

Type specimens. Two probable syntypes of *Mitra japonica* are in the British Museum (Nat.Hist.), London, No. 1967787. The larger, worn and faded syntype, which is conspecific with *Mitra pyramis* Wood, 1828, measures length 37.9 mm, width 10.4 mm, height of aperture 16.1 mm (Fig.22). The smaller worn and faded syntype, which is conspecific with *Vexillum* (*Costellaria*) *acupictum* (Reeve, 1844), is here selected as the lectotype of *Mitra japonica.* The dimensions of the lectotype are length 33.7 mm, width 11.4 mm, height of aperture 15.5 mm. The specimen has 7¼ whorls, the apex is broken, the penultimate whorl has 27 axial ribs and 7-8 spiral grooves, the body whorl *c.* 40 axial ribs and 14 spiral grooves, followed by 7 nodulose cords and 6 cords on the siphonal fasciole, 4 distinct and 1 very small columellar folds and 13 distinct lirae on the interior of the outer lip. The colour is a faded white, ornamented with faded brown axial streaks (Fig. 21).

Figs. 21,22. *"Mitra japonica"* A.Adams. 21. Lectotype B.M. (N.H.) No. 1967787; 33.7 mm [= *Vexillum* (*Costellaria*) *acupictum* (Reeve)]. 22. Syntype B.M. (N.H.) No. 1967787; 37.9 mm [= *Mitra pyramis* Wood].

Habe (1985) in his discussion of *Mitra japonica* A.Adams, did not select a lectotype for the species, nor did he mention the presence of 2 syntypes which not only were different species but belonged to different genera and families. Habe (1985) only illustrated the larger syntype which despite its worn appearance is still recognizable as the species *Mitra pyramis* Wood, 1828, belonging to the family Mitridae.

A.Adams' original description (Adams, 1864), is not at all helpful in determining which of the two specimens formed the basis of the description, and a composite diagnosis cannot be ruled out. Adams' placement of *Mitra japonica* in the Mitrinae and not the Turriculinae (= Costellariidae) where he placed other costellarid species, and the absence of mention of the apertural lirae, would favour a selection of the larger syntype as the lectotype. However, Adams' statement of the spire being of equal length to the aperture and the mention of "small longitudinal plicae and transverse lirae" would be applicable to the smaller syntype. The deciding factor in this lectotype selection has been the fact that *Mitra pyramis* has as yet not been recorded from Japan, whereas *Vexillum* (*Costellaria*) *acupictum* (Reeve) does live in Japan and specimens examined came from Mikawa Bay and Tosa Bay. The selection of the smaller syntype as the lectotype makes *Mitra japonica* A.Adams, 1864, a subjective synonym of *Vexillum* (*Costellaria*) *acupictum* (Reeve, 1844), in the family Costellariidae.

Family VOLUTOMITRIDAE

Genus **Peculator** Iredale, 1924

Peculator Iredale, 1924, Proc.Linn.Soc.N.S.W. 49(3):269. Type species by M *P.verconis* Iredale, 1924. Recent, S.E. Australia.

Peculator verconis Iredale, 1924 (Figs.23,24)

1924. *Peculator verconis* Iredale, Proc.Linn.Soc.N.S.W. 49(3):269, pl.34, fig.5; 1970 Cernohorsky, Bull.Auckland Inst.Mus. No.8:117, pl.14, fig.17 (illustrated holotype).

TYPE LOCALITY. Twofold Bay, N.S.W., Australia, 27-46 m.

Four specimens collected at St.38, N.W. of Rottness I, West Australia, 31°45'S & 115° 09'E, in 144-150 m, by H.M.A.S. "Diamantina" on the 18-3-1972, have been examined. These specimens have been collected devoid of animal and are now deposited in the Australian Museum, Sydney, No.C-149483. They appear to be the first West Australian record of *P.verconis*.

Figs. 23,24. *Peculator verconis* (Iredale). N.W. of Rottness I, West Australia, 144-150 m; AMS No. C-149483. 23. Length 7.6 mm. 24. Immature specimen, length 7.1 mm.

Family OLIVIDAE

Genus **Oliva** Bruguière, 1789

Oliva Bruguière, 1789, Encycl.Méth.Hist.nat.vers 1:XV. Type species by SM (Lamarck, 1799) *Voluta oliva* Linnaeus, 1758. Recent, Indo-Pacific.

Oliva buelowi Sowerby, 1889 (Fig.25)

1889. *Oliva buelowi* Sowerby, J.Linn.Soc.Lond.Zool. 20:395, pl.25, fig.3.
1969. *Oliva* (*Strephona*) *buloui* (sic) Sowerby, Zeigler & Porreca, Olive shells of the world p.66, pl.10, fig.16.
1972. *Oliva buloui* (sic) Sowerby, Hinton, Shells New Guinea & Indo-Pacific, p.50, pl.25, figs.39,40.
1978. *Oliva bulowi* (sic) Sowerby, Hinton, Guide shells Papua New Guinea p.34, figs.8,8a.
1982. *Oliva buloui* (sic) Sowerby, Abbott & Dance, Compendium Seashells p.192, fig.top row, second from left.

TYPE LOCALITY. New Britain, Papua New Guinea.

The species has been presumed to be endemic to Papua New Guinea, and only recently Abbott & Dance (1982) reported it from the Solomon Islands. This range is now extended farther east to Vanuatu, where specimens have been found at Havannah Harbour, Efate I, in 73 m (*leg.* T.Hamlyn-Harris).

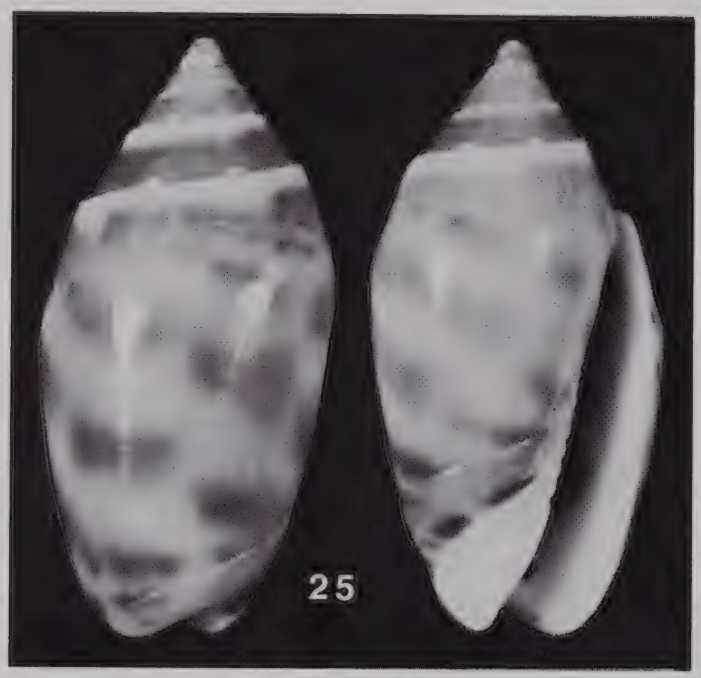


Fig.25. *Oliva buelowi* Sowerby. Havannah Harbour, Efate I, Vanuatu, 73 m; 21.2 mm.

The epithet *"buelowi"* has almost always been misspelt in literature. The species was named after Carl Bülow, Berlin, and Sowerby (1889) spelled it *"bülowi"*. According to the Code of ICNZ (1985), Art.32(d)(i)(2), the Umlaut sign is deleted and the letter "e" is inserted after the vowel. The date of description has been reported as 1887 (Zeigler & Porreca 1969) or 1888 (Abbott & Dance 1982) but the correct publication date is December 1889.

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A TAXONOMIC STUDY ON TWO INDO-PACIFIC SPECIES OF *CANTHARUS (PRODOTIA)* [MOLLUSCA : BUCCINIDAE]

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Abstract. Populations of an Indo-Pacific buccinid species previously considered to belong to a highly variable species, have been examined and tabulated, and are now separated into the two sympatric species *Cantharus* (*Prodotia*) *iostomus* (Gray in Griffith & Pidgeon) and *C.* (*P.*) *lannumi* (Schwengel).

The tropical Indo-Pacific buccinid species *Cantharus* (*Prodotia*) *iostomus* (Gray in Griffith & Pidgeon) has been considered by this author (Cernohorsky 1971, 1985) and other authors, to be composed of highly variable individuals occurring in populations throughout the Indo-Pacific region. However, a detailed study undertaken on 168 specimens of the *"iostomus"* complex revealed the existence of two different species which were found to be sympatric in 5 Indo-Pacific localities. During the study, 119 specimens were assigned to *C.* (*P.*) *iostomus* (Gray in G. & P.) and 49 specimens to *C.* (*P.*) *lannumi* (Schwengel). The emended synonymies for the two species are given below.

Family BUCCINIDAE

Genus **Cantharus** Röding, 1798

Cantharus Röding, 1798, Mus.Bolten. p.132. Type species by SD (Cossmann, 1901) *Buccinum tranquebaricum* Gmelin, 1791. Recent, Indian Ocean.

Subgenus **Prodotia** Dall, 1924

Prodotia Dall, 1924, Proc.Biol.Soc.Washington 37:89. Type species by OD *Pisania billeheusti* Souverbie (= Petit de la Saussaye, 1853) = *Triton iostoma* Gray in Griffith & Pidgeon, 1834. Recent, Indo-Pacific.

Cantharus (Prodotia) iostomus (Gray in Griffith & Pidgeon, 1834) (Figs 1-9, 17)

1834. *Triton iostoma* Gray in Griffith & Pidgeon, Anim.Kingd.Bar.Cuvier, Moll.Radiata 12:600, pl.23,fig.4.
1846. *Buccinum marmoratum* Reeve, Conch.Icon. 3:pl.12,fig.95 (non Link, 1807; nec Anton, 1838).
1853. *Phos billeheusti* Petit de la Saussaye, J.Conchyl. 4(3): 244, pl.8,fig.5; 1856 Petit de la Saussaye, J.Conchyl. 5:42.

Figs. 1-9. *Cantharus* (*Prodotia*) *iostomus* (Gray in Griffith & Pidgeon). 1,2. Paralectotype of *Buccinum marmoratum* Reeve, B.M.(N.H.) No. 1979191; 31.4 mm. 3. Specimen from Broadhurst reef, Qld., Australia, AMS No. C-118669; 30.3 mm. 4,5. Specimens from Apia reef, W. Samoa; 29.8 mm and 22.3mm respectively. 6. Specimen from Rabaul, Papua New Guinea; 19.5 mm (intermediate form). 7. Specimen from Broadhurst reef, Qld., Australia, AMS No. C-118668; 22.0 mm (slender form). 8. Holotype of *Phos billeheusti* Petit, Mus.Nat.d'Hist.Nat.Paris; 28.0 mm. 9. Specimen from Moruroa Atoll, Tuamotu Archipelago; 22.8 mm.

TYPE LOCALITY. None (*iostomus*); Capul I, Philippines (*marmoratum*); Nouka-Hiva = Nukuhiva, Marquesas Is (*billeheusti*).

DISTRIBUTION. From East Africa to French Polynesia and the Hawaiian Islands.

Type specimens. The type of *C.* (*P.*) *iostomus* is lost, but the good illustration from Griffith & Pidgeon (1834, pl.23,fig.4; see Cernohorsky 1975, fig.59) is here designated as the illustrated lectotype. Although the embryonic whorls cannot be counted, the figure does show a slender, pointed protoconch, the whorls are centrally angulate and the presutural ramp concave, the basal constriction is lower on the body whorl and the siphonal canal is more truncated than in *C.* (*P.*) *lannumi.*

The three syntypes of *Buccinum marmoratum* Reeve, are in the British Museum (Nat.Hist.), London, No.1979191, dimensions of lectotype length 32.2 mm. Although the two largest specimens lack a protoconch, the smallest paralectotype has a protoconch of 3¼ whorls. *B.marmoratum* is twice a primary homonym and thus taxonomically unavailable (Figs.1,2).

The holotype of *Phos billeheusti* Petit de la Saussaye, is in the Muséum National d'Histoire Naturelle, Paris, length 28.0 mm, width 10.5mm, height of aperture 13.3 mm. The holotype has a decollate lavender protoconch of only three-quarters of one inrolled whorl, a feature frequently observed in mature individuals of the *Pisania-Prodotia* group of species with a multispiral protoconch (see Cernohorsky 1971, figs.31,21 and 34,35). This feature has been observed in a few specimens of *C.* (*P.*) *iostomus* but has not been encountered in *C.* (*P.*) *lannumi.* The lavender colouring, sculpture, low constriction on body whorl, wider aperture and short siphonal canal, show the species to be conspecific with *C.* (*P.*) *iostomus.* In addition, *C.* (*P.*) *lannumi* has not been recorded east of Samoa.

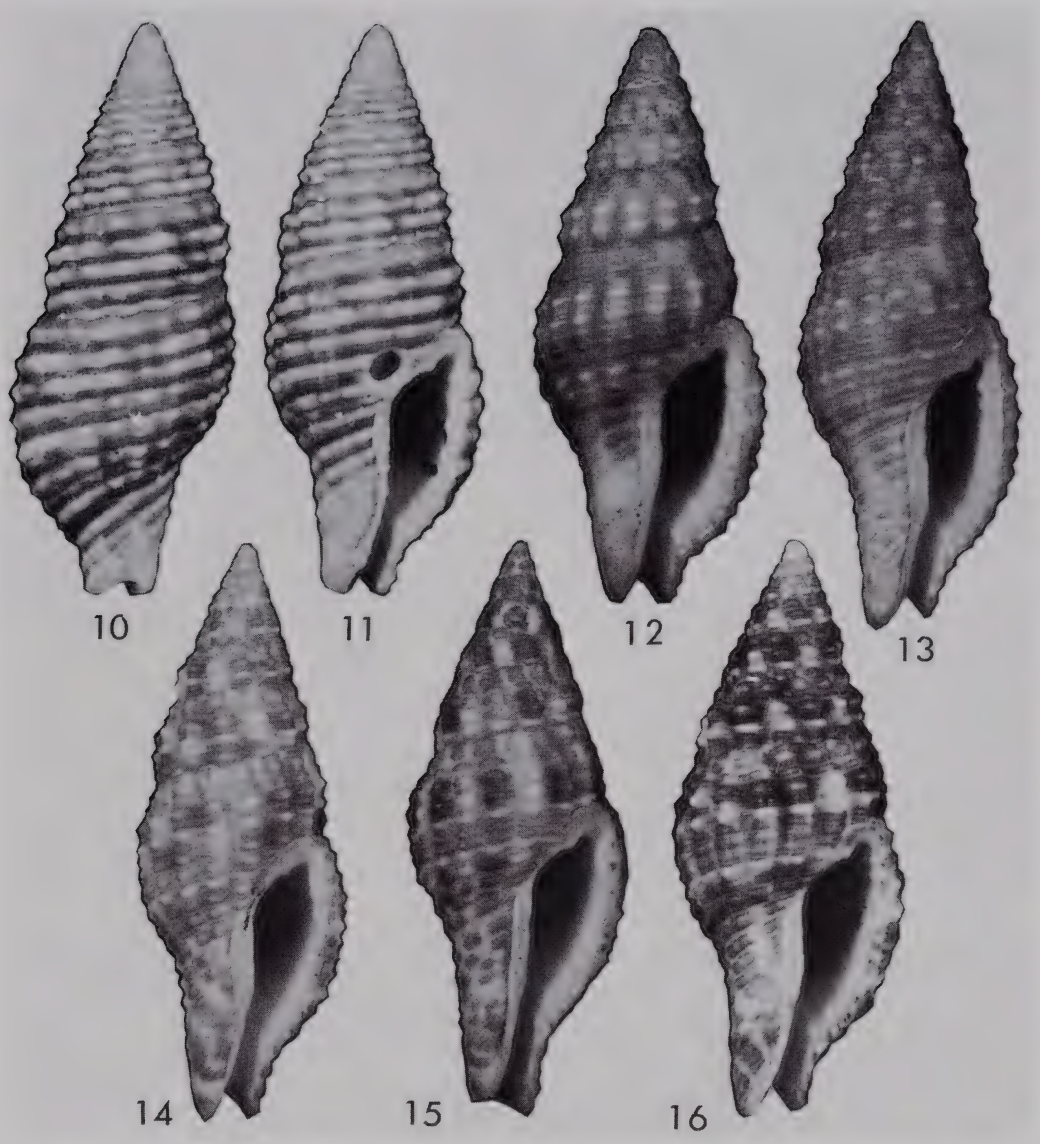
Cantharus (Prodotia) lannumi (Schwengel,1950) (Figs.10-16, 18)

1846. *Buccinum gracile* Reeve, Conch.Icon. 3:pl.12,fig.96 (non da Costa, 1778).
1864. ? *Pisania billeheusti* var.C, *P.artensis* Souverbie & Montrouzier, J.Conchyl. 12:266 (not illustrated).
1865. ? *Fusus* (*Pisania*) *crosseanus* Souverbie in Souverbie & Montrouzier, J.Conchyl. 13:160, pl.5,fig.6 (nom.subst.pro *Pisania artensis* Souverbie & Montrouzier, 1864).
1950. *Phos lannumi* Schwengel, Nautilus 63(3):80, pl.5,fig.3.

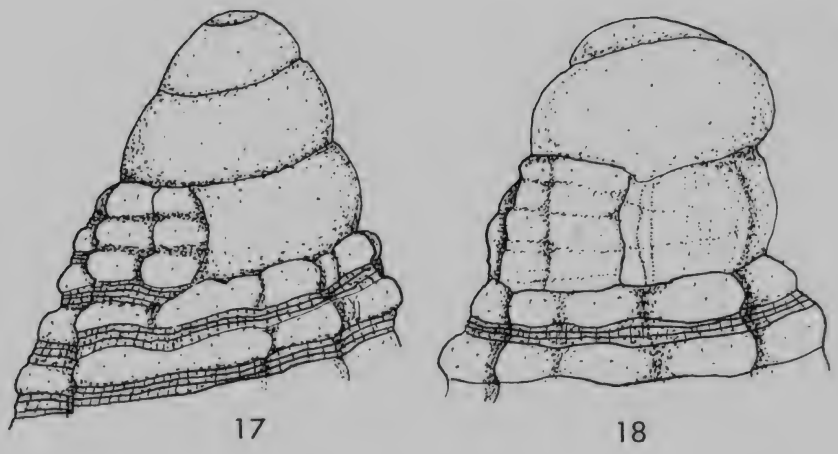
TYPE LOCALITY. Masbate I, Philippines (*gracile*); Art I, New Caledonia (*artensis* and *crosseanus*); Guam I, Marianas Is (*lannumi*).

DISTRIBUTION. From Mauritius to the Samoa Islands.

Type specimens. Three syntypes of *Buccinum gracile* Reeve, are in the British Museum (Nat.Hist.), London, No. 1979192. Two of the syntypes have 1¼ worn embryonic whorls while a young syntype has 1¼ unworn embryonic whorls. The syntype measuring length 21.3 mm, width 7.0 mm (Figs. 10,11) is here designated as the lectotype.



Figs. 10-16 *Cantharus* (*Prodotia*) *lannumi* (Schwengel). 10,11. Lectotype of *Buccinum gracile* Reeve, B.M.(N.H.) No. 1979192; 21.3 mm. 12. Holotype of *Phos lannumi* Schwengel, ANSP No. 186176; 16.7 mm. 13. Specimen from Long I, Torres Strait, N.Australia, AMS No. 77167; 26.2 mm. 14,15. Specimens from Noumea, New Caledonia. 14. AMS No. C-3962; 20.6 mm. 15. AMS No. C-4306; 24.8 mm. 16. Specimen from Apia reef, W.Samoa; 15.3 mm.



Figs. 17,18. Protoconchs. 17. *Cantharus* (*Prodotia*) *iostomus* (Gray in Griffith & Pidgeon). 18. *C.* (*P.*) *lannumi* (Schwengel).

The type specimens of *Pisania artensis* and *Fusus crosseanus* are presumably in the Bordeaux Museum, France, but are not at present available for examination (Dr.P. Bouchet, in litt.). Souverbie & Montrouzier (1864) described the shell of *C.* (*P.*) *billeheusti* (= *C.* (*P.*) *iostomus*) as being "violaceus ornamented with brown" and the protoconch as "rosaceus" without an indication of the actual number of embryonic whorls. They separated the variant *artensis* on the basis of a protoconch of only 1½ smooth, pale horny-coloured embryonic whorls, and the authors also listed differences in sculpture and shell colour. They found that both *billeheusti* (= *iostomus*) and *artensis* co-existed on Art I, New Caledonia. The description strongly indicates that *Pisania artensis* may be an earlier name for *C.* (*P.*) *lannumi.*

Souverbie & Montrouzier (1865) proposed the new name *Fusus* (*Pisania*) *crosseanus* for the description applicable in 1864 to *Pisania artensis*. This time they illustrated the species (1865, pl.5,fig.6) and the figure shows a shell similar in form to *C.* (*P.*) *lannumi.* but it is dark brown in colour with white sutural lines and small white spots and a white central line with white spots on the body whorl; being an immature individual, the denticles in the aperture have not yet been formed. Among the 49 specimens of *C.* (*P.*) *lannumi* examined, there was not a single specimen which even remotely resembled the type figure of *Fusus crosseanus* in colouring. Since the identity of the two New Caledonian taxa cannot be resolved from the description and single illustration, the species must be elucidated on the basis of their type specimens whenever these become available for examination.

The holotype of *Phos lannumi* Schwengel, is in the Academy of Natural Sciences, Philadelphia, No. 186176. Dimensions are length 16.7 mm, width 6.7 mm, height of aperture 8.6 mm; the protoconch has 2¼ cream-coloured embryonic whorls (Fig. 12).

The 119 specimens were measured and pertinent diagnostic characters recorded (Table 1). The more constant differentiating characters are as follows: About 90% of specimens of *C.* (*P.*) *iostomus* have lavender-coloured shells, or shells with a lavender or violet cast at least on the upper spire whorls, whereas 100% of specimens of *C.* (*P.*) *lannumi* have a white to cream base colour and no violet or lavender colour cast. The brown ornamentation is in the form of blotches in *C.* (*P.*) *iostomus,* and in *C.* (*P.*) *lannumi* the nodules are coloured brown or white. *C.* (*P.*) *iostomus* has a conical multispiral protoconch of 3-3½ rosy-mauve to violet or lavender embryonic whorls, with the first whorl very small (Fig.17). *C.* (*P.*) *lannumi* has a paucispiral protoconch of only 1¼-2¼ cream-coloured embryonic whorls, with the first whorl being large (Fig.18). Kay (1979) reports Hawaiian *C.* (*P.*) *iostomus* with only 2½ embryonic whorls, but all the specimens examined from Hilo, Hawaii, had a protoconch of 3-3¼ embryonic whorls. Whorls of the teleoconch tend to be centrally angulate and occasionally echinate in *C.* (*P.*) *iostomus*, whereas the sculpture is predominantly nodulose with more convex whorls in *C.* (*P.*) *lannumi.* In *C.* (*P.*) *iostomus* the penultimate whorl has from 1-6 more axial ribs than the body whorl, but in *C.* (*P.*) *lannumi* the penultimate whorl has 1-3 fewer axial ribs than the body whorl. The aperture in *C.* (*P.*) *lannumi* is narrower, the siphonal canal is more slender and constricted and the body whorl constriction is higher than in *C.* (*P.*) *iostomus.*

Table 1. Comparative shell characters of *C.* (*P.*) *iostomus* and *C.* (*P.*) *lannumi.*

Characters	*C.* (*P.*) *iostomus*	*C.* (*P.*) *lannumi*
Size	To 37.0 mm	To 26.0 mm
Width	30% - 46% of length	30% - 43% of length
Teleoconch	6-9 whorls, frequently with a lavender cast, and with brown blotches.	6-8 worls, ornamented with brown and white on nodules.
Protoconch	3-3½ rosy-mauve embry. whorls.	1¼-2¼ cream embry. whorls.
Axial ribs body whorl	9 - 22	13 - 20
Axial ribs penult whorl	10 - 23	12 - 17
Spiral cords body whorl	6-15 main spirals + intermediate ones, or up to 21 cords of equal size.	10-15 main spirals + intermediate ones, or up to 8 cords of equal size.
Denticles outer lip	6 - 12	8 - 10
Denticles on columella	4 - 8	4 - 7
Cords on fasciole	5 - 10	7 - 10

The two species were found to be sympatric in areas like Mauritius, Philippines, Nth. Australia, the Marshal Is and Western Samoa. A ready separation on the basis of the listed differentiating characters posed no problem and no intergrades were encountered.

Acknowledgements. For the loan of type specimens and other material utilized in this study I am grateful to Dr P. Bouchet, Muséum National d'Histoire Naturelle, Paris; Dr W. Ponder and Mr I. Loch, Australian Museum, Sydney; Dr R. Robertson and staff, Academy Natural Sciences, Philadelphia; Ms K. Way, British Museum (Nat.Hist.) London; Dr S. Johnson, Mid-Pacific Marine Laboratory, Enewetak Atoll, Marshall Is; Mr I. Scott, Auckland, New Zealand, and Mr J. Trondle, La Force, France.

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COLLEMBOLA OF MACQUARIE ISLAND

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Abstract. All known collections of Collembola from Macquarie Island are recorded, from 1901 up to the 1981/82 season. Twenty-three species are now listed for Macquarie I (including Bishop I). Ten species are recorded as before, except *Polykatianna gressitti* is a new combination. Five species names supercede previous misidentifications, *Friesea tilbrooki* (recorded Greenslade 1986) for *Subantarctica* sp., *Tullbergia templei* (recorded Greenslade 1986) for *T. mixta* (part) and *T. mediantarctica, Isotoma* (*Parisotoma*) *insularis* for *Isotoma octooculata, Isotoma* (*Sorensia*) *punctata* for *Sorensia subflava, Isotoma* (*Desoria*) *tigrina* for *Isotoma klovstadi* (the last three are new records here). Specimens of eight other species have been discovered, *Hypogastrura* (*Ceratophysella*) *denticulata* (recorded Greenslade & Wise 1984), and seven new records here, *Isotoma* (*Pseudosorensia*) *atlantica, Cryptopygus dubius, C. caecus, C. lawrencei, C. tricuspis, Lepidosira terraereginae, Megalothorax* sp.

Friesea tilbrooki is also recorded from Bouvetøya in the south Atlantic Ocean.

The first record of Collembola from Macquarie Island was made by G.H. Carpenter (1909) when he recorded *Achorutes viaticus* Tullberg from specimens collected there in November 1901. The British National Antarctic Expedition 1901-04 visited the island on 22 November 1901 and a large party spent several hours ashore. This party included the biologist T.V. Hodgson who later was to collect in Antarctica. Carpenter (1908) described the Antarctic species (as *Gomphiocephalus hodgsoni*) so it seems likely that the Macquarie Island specimens he had received from the British Museum (Carpenter 1909:377) were from collections of the same expedition. In his report on the terrestrial Arthropoda of Macquarie Island, K.C. Watson (1967:3) referred to a visit by "M.A. Hamilton", who collected some insects there in 1894, and stated "Hamilton also collected large numbers of collembola which were determined by Carpenter (1909.)" However, as the specimens recorded by Carpenter (1909) are dated November 1901 Watson's reference must be discounted. A. Hamilton, himself, recorded (1895) the collection of spiders and flies, but not Collembola, and most of his collections were lost (loc. cit., Chilton 1909).

Later, insects from the Australasian Antarctic Expedition 1911-1914 were collected on Macquarie Island by H. Hamilton (son of A. Hamilton) between May 1912 and November 1913. These were recorded by R.J. Tillyard (1920) who recognised three Collembola species (*Achorutes viaticus* Tullberg, *Entomobrya mawsoni* Tillyard, 1920, *Arrhopalites davidi* Tillyard, 1920).

Rec. Auckland Inst. Mus. 23: 67-97 19 December 1986

H. Womersley (1937) recorded the Collembola collected by T.H. Johnston in December 1930 during the British Australian New Zealand Antarctic Research Expedition 1929-1931.

Since 1948 there has been continual occupation of a station on Macquarie Island by members of the Australian National Antarctic Research Expeditions who made further collections. Law & Burstall (1956) mentioned that Collembola were abundant. K.C. Watson (1967) gave the first full account of these collections including Collembola determined by J.T. Salmon. While it was not mentioned in the text or specimen data, Watson's report also apparently included information on Collembola from at least some of the J.H. Calaby collection, made in December 1960, as well as from Watson's own collection made from January to December 1961.

During a period in which the Bernice P. Bishop Museum (Honolulu) Entomology Department was active in the antarctic-subantarctic area (1959-65), two brief visits were made to Macquarie Island. A few of the many Macquarie Island Collembola collected by J.L. Gressitt in December 1960 were recorded by Salmon (1964b, 1974). J. Shoup collected soil and low plant samples on Macquarie Island in February 1965, from which Collembola were later extracted.

Wise (1967) published records of two Macquarie Island species based on specimens in the British Australian New Zealand Antarctic Research Expedition collection (*Isotoma* sp. not *klovstadi*), the Gressitt and the Shoup collections (*Cryptopygus antarcticus*). Records of two other species from Macquarie Island recorded by Wise (1970a), (*Tullbergia bisetosa* and *Sorensia subflava*) were also based on specimens collected by Shoup.

A record by D.J. Lugg, G.W. Johnstone and B.J. Griffin (1978) of a species on Bishop Island, north of Macquarie Island, was based on a determination by P. Greenslade from specimens collected by G. Copson in 1976.

Greenslade and Wise (1984) gave the first record of *Hypogastrura denticulata* on Macquarie I, based on specimens recorded here.

In a recent paper on Heard I Collembola Greenslade (1986) recorded three species for Macquarie I, those of *Friesea tilbrooki* and *Tullbergia templei* being from specimens recorded in this work.

In addition to the records listed above Macquarie Island Collembola have been referred to by Block (1979), Block and Tilbrook (1975), Brown (1964), Carpenter (1921, 1925), Carpenter and Phillips (1922), Deharveng (1981), Denis (1947), Dreux (1971), Gressitt (1961, 1965a, b, c, 1967), Gressitt and Weber (1959), Pryor (1962), Salmon (1949), Stach (1949), Tilbrook (1970), Tillyard (1925, 1926), Womersley (1939) and have been listed by Enderlein (1930), Gressitt (1964, 1970) and Wise (1964, 1977).

Macquarie Island Collembola collections

Collections known to us are listed in Table 1. Material from all collections has been examined by us except for specimens recorded by Carpenter (1909) now in the National Museum of Ireland and here presumed to be from the BNAE collection. Collembola in the AAE collection were first examined by R.J. Tillyard and are now in the Australian Museum, Sydney. The BANZARE collection was first examined by H. Womersley and lodged in the South Australian Museum, Adelaide. The Calaby and Watson collections (ANARE) were both examined by J.T. Salmon although recorded by Watson in his paper on terrestrial arthropods of Macquarie Island, and belong in the Australian National Insect Collection, Canberra, with a duplicate series in the National Museum of New Zealand, Wellington. Collections by Gressitt and by Shoup were made for the Bernice P. Bishop Museum Entomology Department, Honolulu. Originally the Gressitt collection was examined by Salmon and the Shoup collection by Wise. Apparently the Hughes collection was sent to Salmon and belongs in the National Museum of New Zealand, Wellington. The Horning collection was made during the Australian Museum expedition 1977-78 but it appears to contain mostly immatures and no determination records are included here. Of the others (all ANARE), the W.J.M. Vestjens collection is held partly by the National Museum of Victoria, Melbourne and partly the Australian National Insect Collection, Canberra, while collections by Rounsevell, Copson and Cronin were lodged in the South Australian Museum, Adelaide. All these later collections lodged in Australia were first examined by Greenslade.

In this paper initial letters are used for the abbreviations of expedition names and institutions are abbreviated as follows.

AMNZ — Auckland Institute and Museum, Auckland, New Zealand.
AMSY — Australian Museum, Sydney, Australia.
ANIC — Australian National Insect Collection, C.S.I.R.O., Canberra, Australia.
BPBM — Bernice P. Bishop Museum, Honolulu, Hawaii.
NMID — National Museum of Ireland, Dublin, Ireland.
NMNZ — National Museum of New Zealand, Wellington, New Zealand.
NMVM — National Museum of Victoria, Melbourne, Australia.
SAMA — South Australian Museum, Adelaide, Australia.

All recorded identifications are of slide-mounted specimens only. In the "Specimens examined" sections, each entry represents a slide mount and the number in parenthesis is the number of specimens on the slide. Other numbers are collection numbers (with the collection data) or institutional or identifiers number (after the specimen number).

Reference specimens of almost all species have been retained in the South Australian Museum and Auckland Museum collections. J.T. Salmon previously retained some specimens in the National Museum of New Zealand collections.

Identifications have been made by comparison with types in nearly all cases and as indicated in the text or with reliably identified material. A reference collection of Kerguelen species determined by L. Deharveng was deposited in the South Australian

Museum for this purpose. Species of *Hypogastrura* were verified by A. Fjellberg and compared with European material.

Table 1. Macquarie Island Collembola collections.

Expedition	Macquarie	Collector	Collembola Collected	Collembola Lodged	Collembola Recorded
British National Antarctic Expedition 1901-1904	22 Nov. 1901	[?T.V. Hodgson]	22 Nov. 1901	NMID	Carpenter, 1909
Australasian Antarctic Expedition 1911-1914	11 Dec. 1911 -5 Dec. 1913	H. Hamilton	May 1912 - Nov. 1913	AMSY	Tillyard, 1920
British Australian New Zealand Antarctic Research Expedition 1929-1931	2-4 Dec. 1930	T.H. Johnston	2-4 Dec. 1930	SAMA	Womersley, 1937 Salmon, 1964b Wise, 1967
Australian National Antarctic Research Expeditions	4 Dec. 1960 -10 Dec. 1960	J.H. Calaby	4-5 Dec. 1960	ANIC	Watson, 1967
Bernice P. Bishop Museum Entomology Department	4 Dec. 1960 -10 Dec. 1960	J.L. Gressitt	4-10 Dec. 1960	BPBM	Salmon, 1964b Wise, 1967 Salmon, 1974
Australian National Antarctic Research Expeditions	4 Dec. 1960 - Dec. 1961	K.C. Watson	24 Jan. 1961 -1 Dec. 1961	ANIC	Watson, 1967 Salmon, 1974
Australian National Antarctic Research Expeditions	Jan. 1962 - Mar. 1962	W. Hughes	14 Jan. 1962 - 10 Mar. 1962	NMNZ	
Australian National Antarctic Research Expeditions	Mar. 1962 - Nov. 1962	W.J.M. Vestjens	23 Mar. 1962 -12 Jun. 1962 4 Apr. 1962 -5 Oct. 1962	NMVM ANIC	
Bernice P. Bishop Museum Entomology Department	Feb. 1965	J. Shoup	24 Feb. 1965 - 26 Feb. 1965	BPBM	Wise, 1967 Wise, 1970
Australian National Antarctic Research Expeditions	Nov. 1972	D. Rounsevell	Nov. 1972	SAMA	
Australian National Antarctic Research Expeditions	Mar. 1975	D. Rounsevell	11 Mar. 1975	SAMA	
Australian National Antarctic Research Expeditions (Bishop Island)	Feb. 1976	G. Copson	7 Feb. 1976	SAMA	Lugg, Johnstone & Griffin, 1978
Australian National Antarctic Research Expeditions	Nov. 1977 -Oct. 1978	G. Copson	17 Nov. 1977 -19 Oct. 1978	SAMA	
Australian Museum	Nov. 1977 -Jan. 1978	D. Horning	22 Nov. 1977 -17 Jan. 1978	AMSY	
Australian National Antarctic Research Expeditions	Aug. 1980	G. Copson	16 Aug. 1980	SAMA	
Australian National Antarctic Research Expeditions	Dec. 1981 -Jan. 1982	S. Cronin	28 Dec. 1981 -20 Jan. 1982	SAMA	
Australian National Antarctic Research Expeditions	Feb. 1982	S. Cronin and D. Montgomery	3 Feb. 1982	SAMA	

Check List Of Species

Family HYPOGASTRURIDAE

Hypogastrura (*Hypogastrura*) *purpurescens* (Lubbock, 1868)
Hypogastrura (*Hypogastrura*) *viatica* (Tullberg, 1872)
Hypogastrura (*Ceratophysella*) *denticulata* (Bagnall, 1941)

Family NEANURIDAE

Friesea tilbrooki Wise, 1970

Family ONYCHIURIDAE

Tullbergia bisetosa Börner, 1902
Tullbergia templei Wise, 1967

Family ISOTOMIDAE

Isotoma (*Parisotoma*) *insularis* Deharveng, 1981
Isotoma (*Sorensia*) *punctata* Wahlgren, 1906
Isotoma (*Desoria*) *tigrina* Nicolet, 1842
Isotoma (*Pseudosorensia*) *atlantica* (Wise, 1970)
Cryptopygus antarcticus antarcticus Willem, 1901
Cryptopygus caecus Wahlgren, 1906
Cryptopygus dubius Deharveng, 1981
Cryptopygus lawrencei Deharveng, 1981
Cryptopygus tricuspis Enderlein, 1909

Family ENTOMOBRYIDAE

Lepidobrya mawsoni (Tillyard, 1920)
Lepidocyrtus cyaneus cinereus Folsom, 1924
Lepidosira terraereginae (Ellis & Bellinger, 1973)

Family SMINTHURIDAE

Polykatianna davidi (Tillyard, 1920)
Polykatianna gressitti (Salmon, 1964)
Sminthurinus kerguelensis Salmon, 1964
Katianna banzarei Salmon, 1964

Family NEELIDAE

Megalothorax sp.

KEY TO MACQUARIE ISLAND COLLEMBOLA

1. Body globular 2
   Body elongate 5
2. Antennae shorter than head diagonal; blind, white ..... **Megalothorax** sp.
   Antennae longer than head diagonal; ocelli and pigment present 3
3. Smaller, black <1mm long; no spines on vertex; antenna IV not annulated; neosminthuroid setae present; five anterior setae on dens, arranged 1----4; female with bifurcate setae supra-anally ..... **Sminthurinus kerguelensis**
   Large >1 mm long; ± spines on vertex; antennae IV annulated; neosmithuroid setae absent; more than five anterior setae on dens; female without bifurcate setae supra-anally 4
4. Vertex with six spines and two interocularly; antenna IV distinctly annulated; anterior setae on dens arranged 1----24; 7-8 clavate tenent hairs on each leg; inner lamella of mucro evenly toothed, outer smooth ..... **Katianna banzarei**
   Vertex without spines, short curved setae only present, antenna IV with suggestion of annulations; anterior setae on dens arranged 1--1124; 3-4 clavate tenent hairs on leg; both lamellae of mucro smooth ..... **Polykatianna (P.davidi, P.gressitti)**
5. Abdomen III smaller than IV; scales present 6
   Abdomen III equal to IV, scales absent 8
6. White with some darker markings on body; scales elongate, pointed, distributed on dorsal surface of head and abdomen only ..... **Lepidobrya mawsoni**
   Blue; scales rounded, not pointed, present on legs, furca and antennae, as well as body 7
7. Scales yellow, with clear, dark striations ..... **Lepidosira terraereginae**
   Scales colourless, hyaline, without clear, dark striations ..... **Lepidocyrtus cyaneus**
8. Thorax I setose 9
   Thorax I non-setose 14
9. Pseudo-ocelli present; blind, white ..... **Tullbergia** 13
   Pseudo-ocelli absent; ocelli and pigment present 10
10. Anal spines 2; ocelli 8 + 8; postantennal organ present ..... **Hypogastrura** 11
    Anal spines 7-11 (usually 7-8); ocelli 3 + 3; postantennal organ absent ..... **Friesea tilbrooki**
11. Anal spines large, as long as claw, curved; clavate tenent hairs absent; protrusible sac present between antenna III and IV; mucro with rounded tip, not tapering ..... **Hypogastrura (Ceratophysella) denticulata**
    Anal spines smaller, less than half length of claw; clavate tenent hairs present; no protrusible sac between antenna III and IV; mucro tapering with pointed tip 12
12. Leg 2 with tenent hairs all inserted about the same distance from apex ..... **Hypogastrura (Hypogastrura) viatica**
    Leg 2 with one of the tenent hairs more apical than the other two ..... **Hypogastrura (Hypogastrura) purpurescens**

13. Empodial appendage present and well developed with seta, half length of claw ..... **Tullbergia bisetosa**
Empodial appendage absent, small lobe only present ..... **Tullbergia templei**
14. Manubrium with many anterior setae 15
Manubrium with 1 + 1 anterior setae at most 18
15. Ocelli absent or 1 + 1 at most 16
Ocelli present, at least 4 + 4 17
16. Manubrium with slender setae only; no ciliated setae posteriorly on abdomen ..... **Isotoma (Pseudosorensia) atlantica**
Manubrium distally with 1 +1 setae with swollen bases; posterior abdomen with long ciliated setae ..... **Isotoma (Sorensia) punctata**
17. Ocelli 4 + 4; pink or pale grey ..... **Isotoma (Parisotoma) insularis**
Ocelli 8 + 8, dark grey ..... **Isotoma (Desoria) tigrina**
18. Ocelli 8 + 8; clavate tenent hairs absent; dens annulated with 12-17 anterior setae and 7 posteriorly ..... **Cryptopygus dubius**
Ocelli 6 + 6 or fewer, clavate tenent hairs present or absent 19
19. Ocelli 6 + 6; clavate tenent hairs present, dens reduced not annulated; with 5 anterior setae and 4 posterior setae; mucro with two teeth ..... **Cryptopygus antarcticus antarcticus**
Ocelli 2 + 2 or less; clavate tenent hairs absent, dens annulated or reduced 20
20. Ocelli 2 + 2; dens annulated or reduced; mucro with 3 teeth; retinaculum with 1 + 1 setae 21
Ocelli 1 + 1; dens long, annulated, with 9-11 anterior setae and 4 posterior setae; mucro with 5 teeth; retinaculum with 4 + 4 teeth and 1 seta ..... **Cryptopygus caecus**
21. Dens annulated with 13 anterior setae and 6 posterior setae ..... **Cryptopygus tricuspis**
Dens reduced with 4-5 anterior setae and 3 posterior setae ..... **Cryptopygus lawrencei**

Family HYPOGASTRURIDAE Börner, 1913

Genus **Hypogastrura** Bourlet, 1839

Subgenus **Hypogastrura**

Hypogastrura (Hypogastrura) purpurescens (Lubbock, 1868)
Achorutes purpurescens Lubbock, 1868, Trans. Linn. Soc. London 26:302.
Hypogastrura purpurascens: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1):2 (Macquarie I).
Podurhippus purpurascens: Salmon, 1949, Cape Exped. Ser.Bull. 4:9 (Macquarie I).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, Buckles Bay, 2.XII.1930 (3) *Hypogastrura purpurescens* det. Womersley. Station 81, Buckles Bay, 3.XII.1930, Res.234(1). *Hypogastrura viatica* det. Salmon. (ANARE) Garden Cove, tussock grass, 11.VIII.1962, Vestjens, M/62/In/158 (1). Wireless Hill, between rotting *Stilbocarpa,* 12.VI.1962, Vestjens, M/62/In/159 (1). North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (10). North Arm, *Azorella,* -.XI.1972, Rounsevell 6 (12). North Arm, *Stilbocarpa,* -.XI.1972,

Rounsevell 7 (6). Isthmus, litter near biology lab, 11.III.1975, Rounsevell (1). Isthmus, *Poa* debris, 17.XI.1977 Copson 2 (1). Isthmus, *Poa foliosa* debris, 17.XI.1977 Copson 10 (1). Isthmus, *Poa foliosa* debris, 17.XI.1977 Copson 10 (1). Isthmus, *Poa foliosa* debris, 17.XI.1977 Copson 10 (2). Isthmus, debris under *Poa foliosa,* 17.XI.1977 Copson 3 (4). Isthmus, debris under *Poa foliosa,* 17.XI.1977 Copson 3 (3). Isthmus, *Poa* debris, 17.XI.1977 Copson 2 (4).

Distribution. Cosmopolitan (see Salmon 1964a), including Australia, New Zealand, Campbell I and Macquarie I.

This species name has been spelt incorrectly in many publication records according to Salmon (1964a). *Hypogastrura pseudopurpurascens* Womersley, 1928, which was recorded from Campbell I. by Salmon (1949), is synonymous (Stach 1949).

Hypogastrura (Hypogastrura) viatica (Tullberg, 1872)

Achorutes viaticus Tullberg, 1872, Kungl. Svensk. Vet.-Akad. Handl. 10(10):50.
Achorutes viaticus: Carpenter, 1909, Subantarctic Islands New Zealand 1:377 (Macquarie I).
Achorutes viaticus: Tillyard, 1920, Australas. Ant. Exped. Sci. Rep. (C)5(8):10 (Macquarie I).
Achorutes viaticus: Carpenter, 1921, Brit. Ant. ("Terra Nova") Exped. 1910 Nat. Hist. Rep. Zool. 3:263.
Achorutes viaticus: Carpenter & Phillips, 1922, Proc. R. Irish Acad. 36B(2):12, 18-19.
Achorutes viaticus: Carpenter, 1925, Mem. Proc. Manchester Lit. Phil. Soc. 69:88 (Macquarie I).
Achorutes viaticus: Tillyard, 1925, N.Z.J.Sci. Tech. 7(5):301 (Macquarie I).
Achorutes viaticus: Tillyard, 1926, Insects Australia New Zealand,55 (Macquarie I).
Achorutes viaticus: Enderlein, 1930, Ges. Naturf. Freund Berlin: 262 (Macquarie I).
Hypogastrura viatica: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1):1-2.
Hypogastrura viatica: Womersley, 1939, Primitive Insects South Australia, 91, 264, 269.
Neogastrura viatica: Stach, 1949, Acta Monogr. Mus. Hist. Nat. Cracov:89 (Macquarie I).
Podurhippus viaticus: Salmon, 1949, Cape Exped. Ser Bull. 4:9 (Macquarie I).
Hypogastrura viatica: Gressitt, 1967, Ant. Res. Ser. 10:14 (Macquarie I).
Hypogastrura viatica: Wise, 1967, Ant. Res. Ser. 10:46 (Macquarie I).
Hypogastrura antarctica: Watson, 1967, ANARE Sci. Rep. (B)1(99):18 (Macquarie I).
Hypogastrura viatica: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).
Hypogastrura antarctica: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).

Specimens examined. MACQUARIE I. (AAE) Collembola common on decaying animal and vegetable matter (6) AAE I1 K42844. *Achorutes viaticus* det. Tillyard. (BANZARE) Station 81, Hasselborough Bay 2.XII.1930, Coll.1669 (1). Station 81, Hasselborough Bay, bog, 4.XII.1930, Coll.1667 (1). *Hypogastrura antarctica* det. Salmon. Station 81, Hasselborough Bay, bog, 4.XII.1930, Coll.1667 (1). *Hypogastrura antarctica* det. Salmon. Station 81, Hasselborough Bay, Res 70,2-3.XII.1930, (1). *Hypogastrura antarctica* det. Salmon. Station 81, swampy land near Buckles Bay, Res.234-a, 3.XII.1930, (1). *Hypogastrura antarctica* det. Salmon. Station 81, swampy land near Buckles Bay, Res.234-a, 3.XII.1930, (1) *Hypogastrura antarctica* det. Salmon. Station 81, swampy land near Buckles Bay, Res.234-a, 3.XII.1930, (1). *Hypogastrura antarctica* det. Salmon. Station 81, swampy land near Buckles Bay, Res.234-a, 3.XII.1930, (1). *Hypogastrura antarctica* det. Salmon. Station 81, Hasselborough Bay, bog, Coll.1667, 4.XII.1930 (1). *Hypogastrura antarctica* det. Salmon. Station 81, N end of island, vegetation from swampy creek, Res.94-b, 2.XII.1930, (1). *Hypogastrura antarctica* det. Salmon. (ANARE) Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 5. Garden Cove, 4.XII.1960, Calaby, M/60/In/10a (1). *Hypogastrura antarctica* det. Salmon 7. Green Gorge, 4.XII.1960,

Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 7. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 7. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 7. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 7. Green Gorge, 4.XII.1960, Calaby, M/60/In/9a (1). *Hypogastrura antarctica* det. Salmon 7. Garden Cove, 4.XII.1960, Calaby, M/60/In/10a (1). *Hypogastrura antarctica* det. Salmon 7. (BPBM ED). 4 m N, *Poa* roots, 5.XII.1960, Gressitt (1). A227. 4 m N, *Poa* roots, 5.XII.1960, Gressitt (1). A227. 4 m N, *Poa* roots, 5.XII.1960, Gressitt (1). A227. NE coast, under kelp, 10.XII.1960, Gressitt (1). A220. NE coast, under kelp, 10.XII.1960, Gressitt (1). A220. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (2). A136. *Hypogastrura antarctica* det. Salmon. Plateau, NE moss, 5.XII.1960, Gressitt (2). A125. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (2). A138. *Hypogastrura antarctica* det. Salmon. N end, *Poa* roots, 10.XII.1960, Gressitt (2). *Hypogastrura antarctica* det. Salmon. N end, *Poa* roots, 10.XII.1960, Gressitt (2). *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (1). A122. *Hypogastrura antarctica* det. Salmon. N end 2m, *Poa* roots, 10.XII.1960, Gressitt (2). A131. *Hypogastrura antarctica* det. Salmon. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (2). A137. *Hypogastrura antarctica* det. Salmon. N end, *Poa* roots, moss, soil, 10.XII.1960, Gressitt (1). *Hypogastrura antarctica* det. Salmon. NE coast, tussock, 2 m behind beach, 10.XII.1960, Gressitt (1). A141. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (2). A138. NE 2 m, *Poa,* 10.XII.1960, Gressitt (2). A124. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A121. *Hypogastrura antarctica* det. Salmon. N 100 m, *Stilbocarpa,* 5.XII.1960, Gressitt (1). A117. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A121. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A121. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A121. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A121. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (2). A122. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (1). A122. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A124. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A124. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (2). A124. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A124. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A124. *Hypogastrura antarctica* det. Salmon. NE Plateau, moss, 5.XII.1960, Gressitt (1). A125. *Hypogastrura antarctica* det. Salmon. NE Plateau, moss, 5.XII.1960, Gressitt (1). A125. *Hypogastrura antarctica* det. Salmon. NE Plateau, moss, 5.XII.1960, Gressitt (1). A125. *Hypogastrura antarctica* det. Salmon. N end, moss-*Azorella,* 7.XII.1960, Gressitt (1). A134. *Hypogastrura antarctica* det. Salmon. Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (1). A137. *Hypogastrura antarctica* det. Salmon. Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (1). A137. *Hypogastrura antarctica* det. Salmon. Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (1). A137. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach, 10.XII.1960, Gressitt (1). A138. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach, 10.XII.1960, Gressitt (1). A138. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (1). A141. *Hypogastrura antarctica* det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A124. *Hypogastrura antarctica* det Salmon. Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (1). A137. *Hypogastrura antarctica* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (1). A138. *Hypogastrura antarctica* det. Salmon. N. Head, *Azorella,* 8.XII.1960, Gressitt (1). A204. *Hypogastrura antarctica* det. Salmon. 4 m N, under stones, 5.XII.1960, Gressitt (1). A209.

Hypogastrura antarctica det. Salmon. 4 m N, under stones, 5.XII.1960, Gressitt (1). A209. *Hypogastrura antarctica* det. Salmon. 4 m N, under stones, 5.XII.1960, Gressitt (1). A209. *Hypogastrura antarctica* det. Salmon. 5 m N, moss, 5.XII.1960, Gressitt (1). A222. *Hypogastrura antarctica* det Salmon. 5 m N, moss, 5.XII.1960, Gressitt (1). A222. *Hypogastrura antarctica* det Salmon. N Head, W coast, *Azorella,* 9.XII.1960, Gressitt (1). A224. *Hypogastrura antarctica* det. Salmon. N Head, W coast, *Azorella,* 9.XII.1960, Gressitt (1). A224. *Hypogastrura antarctica* det. Salmon. 4 m N, stagnant pool, 5.XII.1960, Gressitt (1). A226. *Hypogastrura antarctica* det. Salmon. 4 m N, stagnant pool, 5.XII.1960, Gressitt (1). A226. *Hypogastrura antarctica* det. Salmon. 3 m N, carrion, 5.XII.1960, Gressitt (1). A228. *Hypogastrura antarctica* det. Salmon. NW coast, *Pleurophyllum,* 10.XII.1960, Gressitt (1). A229. *Hypogastrura antarctica* det. Salmon. NW coast, *Pleurophyllum,* 10.XII.1960, Gressitt (1). A229. *Hypogastrura antarctica* det. Salmon. 4 m N, moss, 5.XII.1960, Gressitt (1). A233. *Hypogastrura antarctica* det. Salmon.N end, *Poa* roots, moss, soil, 10.XII.1960, Gressitt (2). *Hypogastrura antarctica* det. Salmon. N end, *Poa* roots, moss, soil, 10.XII.1960, Gressitt (2). *Hypogastrura antarctica* det. Salmon. (ANARE) Camp Hill, sheep dung and soil, 19.IV.1961, Watson M/61/Z/72 (1). *Hypogastrura antarctica* det. Salmon, 5. Aerial Cove, Gentoo rookery, 23.II.1961, Watson M/61/Z/13 (1). *Hypogastrura antarctica* det. Salmon, 5. Nuggets Point, *Stilbocarpa* litter, 2.III.1961, Watson M/61/Z/27 (1). *Hypogastrura antarctica* det. Salmon, 5. Hasselborough Bay, mud, rotting kelp, 28.IX.1961, Watson M/61/Z/186 (1). *Hypogastrura antarctica* det. Salmon, 5. Hurd Point, under beach rocks, 10.II.1961, Watson M/61/Z/12 (1). *Hypogastrura antarctica* det. Salmon, 5. Garden Cove, coastal rock, 20.VI.1961, Watson M/61/Z/155 (1). *Hypogastrura antarctica* det. Salmon, 5. Hurd Point, under beach rocks, 10.II.1961, Watson M/61/Z/12 (1). *Hypogastrura antarctica* det. Salmon, 5. Nuggets Point, *Stilbocarpa* litter, 13.X.1961, Watson M/61/Z/199 (1). *Hypogastrura antarctica* det. Salmon, 5. North Head, *Poa hamiltoni,* 3.III.1961, Watson M/61/Z/33 (1). *Hypogastrura antarctica* det. Salmon, 5. Hasselborough Bay, mud, rotting kelp 28.IX.1961, Watson M/61/Z/186 (1). *Hypogastrura antarctica* det. Salmon, 9. Campbarn, hay and manure, 7.III.1961, Watson, M/61/Z/114 (1). *Hypogastrura antarctica* det. Salmon, 5. Isthmus, on top of water, 18.II.1962, Hughes (1). A234. *Hypogastrura antarctica* det. Salmon. Wireless Hill, between rotting *Stilbocarpa,* 12.VI.1962, Vestjens, M/62/In/159(1). Isthmus, pond surface near biology lab., -.XI.1972, Rounsevell 5 (many). Isthmus, litter near biology lab., 11.III.1975, Rounsevell (1). Isthmus, *Poa* debris, 17.XI.1977, Copson 2 (4). Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 3 (5). Bauer Bay 20 m alt., moss and *Callitriche antarctica* in slow running water, 16.VIII.1978, Copson 13 (1). Aerial Cove, in brackish water, 16.VIII.1980, Copson (21). Aerial Cove, in brackish water, 16.VIII.1980, Copson (24).

Distribution: Cosmopolitan (see Salmon 1964a), including Macquarie I and most subantarctic islands.

The species *Hypogastrura antarctica* described by Salmon (1962) was synonymised with *H. viatica* by Wise (1971).

Mr James P. O'Connor, Dublin, has recently confirmed (pers. comm.) that Macquarie I specimens of *Hypogastrura viatica* examined by G.H. Carpenter are dated "Nov. 1901". The source suggested by Watson (1967) is therefore incorrect.

Subgenus **Ceratophysella** Börner, 1932

Hypogastrura (Ceratophysella) denticulata (Bagnall, 1941)

Achorutes denticulatus Bagnall, 1941, Ent. Mon. Mag. 77:218.

Hypogastrura denticulata: Greenslade & Wise, 1984, Trans. R.Soc. S. Aust.108(4):204. (Macquarie I).

Specimens examined. MACQUARIE I. (ANARE) Isthmus, litter near biology hut, -.XI.1972, Rounsevell 2 (36). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 7 (17). Isthmus, litter near biology lab, 11.III.1975, Rounsevell (2). Isthmus, *Poa* debris, 17.XI.1977, Copson 2 (1). Isthmus, *Poa* debris, 17.XI.1977, Copson 2 (4). Isthmus, *Poa foliosa* debris, 17.XI.1977, Copson 10(2). Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 3 (12).

Distribution. Mainly Northern Hemisphere (see Salmon 1964a), but probably well distributed in the Southern Hemisphere, including Macquarie I and possibly Crozet and Marion Is (Deharveng 1981).

Family NEANURIDAE *sensu* Massoud, 1967

Genus **Friesea** Dalla Torre, 1895

Friesea tilbrooki Wise, 1970
Friesea tilbrooki Wise, 1970, Pacific Ins. Monogr. 23:190 (South Georgia).
Subantarctica sp. Watson, 1967, ANARE Sci. Rep. (B)1 (99):18 (Macquarie I).
Friesea viennei Deharveng, 1981, C.N.F.R.A. 48:46 (Heard I).
Friesea tillbrooki: Deharveng, 1981, C.N.F.R.A. 48:49 (South Georgia) [in error for *tilbrooki*].
Friesea tilbrooki: Greenslade, 1986, Rec. S. Aust. Mus.19(7):92 (Macquarie I).

Specimens examined. MACQUARIE I. (BPBMED) Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (1). A137. *Protachorutes* det. Salmon. (ANARE) Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/155 (1). North Head, *Stilbocarpa* litter, 27.II.1961, Watson, M/61/Z/22 (1). *Subantarctica* det. Salmon. Plateau, *Stilbocarpa* soil and litter, 26.VI.1961, Watson, M/61/Z/106 (1). Mt Elder, Prion nest, 28.II.1961, Watson, M/61/Z/24 (1). Hasselborough Bay, mud, rotting kelp, 28.IX.1961, Watson, M/61/Z/186 (1). Aerial Cove, coast rocks, 23.II.1961, Watson, M/61/Z/16 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, Royal Rookery, 3.III.1961, Watson, M/61/Z/32 (1). North Head, coastal rocks, 27.VI.1961, Watson, M/61/Z/110 (1). North Head, coastal rocks, 27.VI.1961, Watson, M/61/Z/110 (1). North Head, coastal rocks, 27.VI.1961, Watson, M/61/Z/110 (1). North Head, coastal rocks, 27.VI.1961, Watson, M/61/Z/110 (1). North Head, Royal Penguin Rookery, 27.II.1961, Watson, M/61/Z/21 (1). Garden Cove, rock hopper nest, 30.IX.1961, Watson, M/61/Z/187 (1). North Head, *Poa hamiltoni,* 27.VI.1961, Watson, M/61/Z/109 (1). Nuggets Point, coastal rocks, 2.III.1961, Watson M/61/Z/29 (1). Catchme Point, coastal rocks, 8.V.1961, Watson, M/61/Z/78 (1). Catchme Point, coastal rocks, 8.V.1961, Watson, M/61/Z/78 (1). Catchme Point, coastal rocks, 8.V.1961, Watson, M/61/Z/78 (1). Catchme Point, coastal rocks, 8.V.1961, Watson, M/61/Z/78 (1). BOUVETØYA Nyrøysa, 3.XII.1978, L. Sømme Sample 9-1 (3). KWBa 1. Nyrøysa, 3.1.1979, L. Sømme Sample 17-2 (7), KWBA 3.

Distribution. South Georgia (type locality), Bouvetøya (new record), Heard I, Macquarie I.

Wise (1970a) described the species based on three specimens from South Georgia and Deharveng (1981) described *Friesea viennei* from a single specimen collected on

Heard I. Following the examination of many Macquarie I specimens and a few from Bouvetøya, together with the South Georgia holotype, Greenslade (1986) considered that the specimens from all these islands are conspecific.

Family ONYCHIURIDAE Börner, 1913

Subfamily TULLBERGIINAE Bagnall, 1935

Genus **Tullbergia** Lubbock, 1876

Tullbergia bisetosa Börner, 1902

Tullbergia bisetosa Börner, 1902, Zool. Anz. 26(689):128 (Kerguelen).
Tullbergia bisetosa: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1):2 (Macquarie I).
Tullbergia bisetosa: Denis, 1947, Mem. Mus. Hist. Nat.Paris (N.S.) 20:41 (Macquarie I).
Tullbergia bisetosa: Salmon, 1949, Cape Exped. Ser. Bull.4:17 (Macquarie I).
Tullbergia bisetosa: Brown, 1964, ANARE Rep. (B)1(73):9 (Macquarie I).
Tullbergia bisetosa: Wise, 1967, Ant. Res. Ser. 10:128 (Macquarie I).
Mesaphorura sp. Watson, 1967, ANARE Sci. Rep. 1(99):18 (Macquarie I).
Tullbergia mixta: Watson, 1967, ANARE Sci. Rep. (B)1(99):18 (Macquarie I) (nec Wahlgren, 1906) (part).
Tullbergia bisetosa: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).
Tullbergia bisetosa: Wise, 1970, Pacific Ins. Monogr. 23:184 (Macquarie I).
Tullbergia bisetosa: Dreux, 1971, Insecta. Marion & Prince Edward Islands, 341 (Macquarie I).
Tullbergia bisetosa: Salmon, 1974, Zool. Publ. Victoria Univ. Wellington No.66:4 (Macquarie I).
Tullbergia bisetosa: Greenslade, 1986, Rec. S. Aust. Mus. 19(7):94 (Macquarie I).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, 2.XII.1930, Coll.1669 (1). *Tullbergia bisetosa* det. Womersley. Station 81, 3.XII.1930, Coll.1673 (2). *Tullbergia bisetosa* det. Womersley. (BPBMED) NE 2 m, soil, 5.XII.1960, Gressitt (1). A143. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (1). A147. N. end, 7.XII.1960, Gressitt (1). A146. N. end, 7.XII.1960, Gressitt (1). A146. (ANARE) Douglas Bay, herbfield litter, 26.I.1961, Watson, M/61/Z/10 (1). *Mesaphorura* det. Salmon, 2. Langdon Point, *Stillbocarpa* litter 26.I.1961, Watson, M/61/Z/11 (1). *Mesaphorura* det. Salmon, 2. First Gully, *Poa foliosa,* 24.II.1961, Watson M/61/Z/18 (1). *Mesaphorura* det. Salmon, 2. First Gully, *Poa foliosa,* 24.II.1961, Watson M/61/Z/18 (1). *Mesaphorura* det. Salmon, 2. First Gully, *Poa foliosa* soil, 24.II.1961, Watson M/61/Z/19 (1). *Mesaphorura* det. Salmon, 2. Camp Hill, *Poa annua* and *foliosa,* 13.VII.1961, Watson, M/61/Z/120 (1). *Mesaphorura* det. Salmon, 2. Plateau, soil and litter of *Stilbocarpa,* 26.VI.1961, Watson, M/61/Z/106 (1). *Tullbergia mixta* det. Salmon. Plateau above Bauer, nest material of whiteheaded petrel, 4.IV.1962, Vestjens, M/62/In/15(1). Plateau above Bauer, nest material of whiteheaded petrel, 4.IV.1962, Vestjens, M/62/In/15(1). (BPBMED) North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI5. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI9a. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI9b. South face North Head, soil, grass roots, 26.II.1965, Shoup (1). KWMI12. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI17a. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI17b. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI121. Top of Gadget Gully 183 m, soil, stones, low plants, 24.II.1965, Shoup (1). KWMI31a. Top of Gagdet Gully 183 m, soil, stones, low plants, 24.II.1965, Shoup (1). KWMI31a. (ANARE) North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (1). North Arm, *Azorella,* -.XI.1972, Rounsevell 6 (1). Bayer Bay hut 20 m, *Poa foliosa-Stilbocarpa* debris, 19.X.1978, Copson 5 (1).

Distribution. Kerguelen (type locality) Marion I, Macquarie I, Heard I, South Georgia, Falkland Is, Tierra del Fuego.

This species was first recorded from Macquarie I by Womersley (1937) who synonymised *T. insularis* Wahlgren, 1906 without explanation. Wise (1970a) and Salmon (1974) confirmed the presence of *T. bisetosa* on Macquarie I from Shoup and Gressitt specimens respectively.

Tullbergia templei Wise, 1967

Tullbergia templei Wise, 1967, Pacific Ins. Monogr. 23:210 (Heard I).
Tullbergia mixta: Watson 1967, ANARE Sci. Rep. (B)1(99):18 (Macquarie I) (nec Walgren, 1906) (part).
Tullbergia mixta: Gressitt, 1970, Pacific Ins. Monogr.23:324 (Macquarie I).
Tullbergia mediantartica: Lugg, Johnstone & Griffin, 1978, Geograph. J. 144(2):284 (Bishop I) (in error for *mediantarctica*).
Tullbergia cf. *templei:* Deharveng, 1981, C.N.F.R.A.48:68 (Kerguelen).
Tullbergia templei: Greenslade, 1986, Rec. S. Aust.Mus. 19(7):95 (Macquarie I).

A series of 36 specimens from a sample of Bishop I soil were compared and found to vary in number of tubercles in the PAO, development of pseudocelli on abdominal segments I, II and III, and size of sense rods on antenna III. A third of the specimens were asymmetric.

The number of tubercles in the PAO was 20-40 (mean 29) in Bishop I specimens. For samples from Heard I this number was 39-42 and for Kerguelen specimens examined was 32-43, not 50-80 as given by Deharveng (1981). In view of the variation in this character and others, it is considered at present that all the specimens examined belong to one variable species.

Specimens examined. MACQUARIE I. (ANARE) Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). *Tullbergia mixta* det. Salmon. Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 18.IX.1961, Watson, M/61/Z/179 (1). Garden Cove, coastal rocks, 20.VI.1961, Watson, M/61/Z/155 (1). *Tullbergia mixta* det. Salmon. Garden Cove, coastal rocks, 20.VI.1961, Watson, M/61/Z/155 (1). Garden Cove, coastal rocks, 20.VI.1961, Watson, M/61/Z/155 (1). North Head cave, in rotting feathers, 6.VI.1962, Vestjens, M/62/In/29 (1). Bishop I 55° 06'S 158° 43'E, ex soil, 7.II.1976, Copson (2). *Tullbergia* cf. *mediantarctica* det. Greenslade. Bishop I 55° 06'S 158° 43'E, ex soil, 7.II.1976, Copson (5). Bishop I 55° 06'S 158° 43'E, ex soil, 7.II.1976, Copson (8). Bishop I 55° 06'S 158° 43'E, ex soil, 7.II.1976, Copson (8). Bishop I 55° 06'S 158° 43'E, ex soil, 7.II.1976, Copson (9).

Distribution. Heard I (type locality), Macquarie I including Bishop I (new records), Kerguelen (new record).

Following the description of this species from Heard I by Wise (1970b), Deharveng (1981) recorded similar specimens from Kerguelen. The type specimens have been re-examined and compared with specimens from Macquarie I, Bishop I and Kerguelen Is; all are considered to be conspecific.

Family ISOTOMIDAE Börner, 1901

Genus **Isotoma** Bourlet, 1839

Deharveng (1981), while reviewing southern hemisphere species based on subantarctic islands faunas, stabilised the classification in the Family Isotomidae by placing several genera as subgenera of *Isotoma*. Deharveng's classification is accepted here and species occuring on Macquarie I are arranged accordingly.

Subgenus **Parisotoma** Bagnall, 1940

Isotoma (Parisotoma) insularis Deharveng, 1981
Isotoma (*Parisotoma*) *insularis* Deharveng, 1981, C.N.F.R.A. No. 48:86 (Crozet).
Isotoma octo-oculata: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1):4 (Macquarie I).
Parisotoma octo-oculata forma principalis: Salmon, 1949, Cape Exped. Ser. Bull. 4:36 (Macquarie I).
Parisotoma octo-oculata: Brown, 1964, ANARE Rep. (B)1(73): 11 (Macquarie I).
Parisotoma octo-oculata ovata: Watson, 1967, ANARE Sci. Rep. (B)1(99): 19 (Macquarie I).
Parisotoma octooculata: Wise, 1967, Ant. Res. Ser. 10:138,146 (Macquarie I).
Parisotoma octooculata: Gressitt, 1967, Ant. Res. Ser. 10:14 (Macquarie I).
Parisotoma octooculata: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).
Parisotoma octooculata: Wise, 1970, Pacific Ins. Monogr.23:201 (Macquarie I).

Specimens from Macquarie I were compared with Deharveng's (1981) description of *Isotoma* (*Parisotoma*) *insularis* and found to be similar but differed in having a larger PAO. They were compared with the holotype and paratypes of this species and found to be conspecific.

Examination of the holotype of *I.* (*P.*) *insularis* has permitted some corrections to the published descriptions (1981). The following character descriptions require modification: postlabial setae 11, 12 on holotype, not in straight line; tenent hairs a little longer than ordinary setae not shorter; ventral tube with 5 + 5 anterior setae not 10, and 6 or 7 posterobasal setae not 3 or 4, distal setae 2 + 2; manubrium with more than 40 setae ventrally, not more than 30; dens with more setae ventrally than dorsally where there are only 10-12; anterior fungal subcoxa with about 80, not 90, setae and 20-23 setae posteriorly; rami tenaculum with 4-9 setae on the base, rarely 4 (only 1 in 13 specimens examined).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, 2.XII.1930, Coll. 1669, (1). *Isotoma octo-oculata* det. Womersley. (BPBMED) N end, *Poa* roots, moss, soil, 10.XII.1960, Gressitt (2). *Sorensia subflava* det. Salmon. N end (NW), 10.XII.1960, Gressitt, (1). A126. N end, 7.XII.1960, Gressitt, (1). A133. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (1). A132. Plateau NE, moss, 5.XII.1960, Gressitt (3). A130. NE 2 m, soil, 5.XII.1960, Gressitt (3). A129. NE 2 m, *Poa,* 10.XII.1960, Gressitt (3). A118. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (1). A136. NE 2 m, *Poa,* 10.XII.1960, Gressitt (3). A120. N end (NW), 10.XII.1960, Gressitt (3). A126. NW coast, *Pleurophylum* debris, 10.XII.1960, Gressitt (1). A199. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A118. *Parisotomo octo-oculata* det. Salmon. Base 2 m, tussock roots, soil, 5.XII.1960, Gressitt (2). A132. *Parisotoma octo-oculata* det. Salmon. W end (NW), *Pleurophyllum* debris, 19.XII.1960, Gressitt (2). *Parisotoma octo-oculata* det. Salmon. NE base 2 m, *Azorella,* 9.XII.1960, Gressitt (1). A231. *Parisotoma*

octo-oculata det. Salmon. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A120. *Parisotoma octo-oculata* det. Salmon. NE 2 m, soil, 5.XII.1960, Gressitt (2). A129. *Parisotoma octo-oculata* det. Salmon. N end, moss, *Azorella,* 7.XII.1960, Gressitt (2). A133. *Parisotoma octo-oculata* det. Salmon. NE 2 m, soil, 5.XII.1960, Gressitt (2). A129. *Parisotoma octo-oculata* det. Salmon. (ANARE) North Head, *Poa hamiltoni,* 3.III.1961, Watson, M/61/Z/33, (1). Subplateau, *Stilbocarpa* litter, 23.VIII.1961, Watson, M/61/Z/157 (1). First Gully, *Stilbocarpa* litter, 24.II.1961, Watson, M/61/Z/20 (1). Gadget Gully, *Stilbocarpa* litter, 7.III.1961, Watson, M/61/Z/41 (1). *Parisotoma octo-oculata ovata* det. Salmon. Hurd Point, under beach rocks, 10.II.1961, Watson, M/61/Z/12 (1). *Parisotoma octo-oculata ovata* det. Salmon. Wireless Hill, between *Stilbocarpa,* 12.VI.1962, Vestjens, M/62/In/175 (3). (BPBMED) North Head 15m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI2a. *Parisotoma octo-oculata ovata* det. Salmon. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI2b. *Parisotoma octo-oculata ovata* det. Salmon. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI6. *Parisotoma octo-oculata ovata* det. Salmon. North of Nuggets Pt, sea level, soil, 25.II.1965, Shoup (1). KWMI13. *Parisotoma octo-oculata ovata* det. Salmon. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI23. *Parisotoma octo-oculata ovata* det. Salmon. Mud, gravel, -.II.1965, Shoup (1). KWMI26a. *Parisotoma octo-oculata ovata* det. Salmon. Mud, gravel, -.II.1965, Shoup (1). KWMI26b. *Parisotoma octo-oculata ovata* det. Salmon. Soil, low plants, -.II.1965, Shoup (1) KWMI28. *Parisotoma octo-oculata ovata* det. Salmon. Soil, low plants, -.II.1965, Shoup (1). KWMI28. *Parisotoma octo-oculata ovata* det. Salmon. Soil, low plants, -.II.1965, Shoup (1). KWMI28. *Parisotoma octo-oculata ovata* det. Salmon. (ANARE) North Arm, *Sphagnum,* -.XI.1972, Rounsevell I (6). Isthmus, litter nr. biology hut -.XI.1972, Rounsevell 2 (2). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 2 (2). Isthmus, litter from nr. biology lab, 11.III.1975, Rounsevell (1). Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 2 (2). Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 3 (3). Isthmus, *Poa foliosa* debris, 5 m, 17.XI.1977, Copson 10 (1). Isthmus, coastal rock, *Colobanthus,* 20.XI.1977, Copson 1 (1). Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (2). Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (1). Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (1). Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (1). Hasselborough Bay, soil under *Poa foliosa,* 20.I.1982, Cronin (1).

Distribution. Crozet Is (type locality), Macquarie I (new record).

In his re-arrangement of *Isotoma* species into subgenera, Deharveng (1981:91) has placed *Isotoma octooculata* Willem, 1902 (previously known as *Parisotoma octooculata:* Salmon, 1949) in the subgenus *Sorensia* and has elevated the subspecies *Isotomo octooculata kerguelensis* Enderlein, 1903 to specific rank as *Isotoma* (*Sorensia*) *kerguelensis.* However, we consider that the subspecies *Parisotoma octooculata ovata* Salmon, 1949, of Campbell I, should remain in *Parisotoma* and be elevated to specific rank as *Isotoma* (*Parisotoma*) *ovata* (Salmon, 1949).

All previous Macquarie I records of *Parisotoma octooculata* (=*Isotoma octo-oculata*) or *Parisotoma octooculata ovata* are found to be based on specimens of the present species.

Subgenus **Sorensia** Salmon, 1949

Isotoma (Sorensia) punctata Wahlgren, 1906

Isotoma punctata Wahlgren, 1906, Wiss. Ergebn. Schwed. Sudpolar-Exped., 1901-1903 5(9):14.
Sorensia subflava: Watson, 1967, ANARE Sci. Rep. (B)1(99): 19 (Macquarie I).

Sorensia subflava: Wise, 1970, Pacific Ins. Monogr. 23: 194 (Macquarie I).
Sorensia subflava: Gressitt, 1970, Pacific Ins. Monogr. 23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (BPBMED) Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (1). A144. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (3). A144. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (2). A144. *Parisotoma octo-oculata* det Salmon. Base 2 m, tussock, roots, soil, 5.XII.1960, Gressitt (1). A144. *Parisotoma octo-oculata* det. Salmon. N end, moss, *Azorella,* 7.XII.1960, Gressitt (1). A145. *Parisotoma octo-oculata* det. Salmon. N end, moss, *Azorella,* 7.XII.1960, Gressitt (3). A145. N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (3). A142. N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (1). A142. *Parisotoma octo-oculata* det. Salmon. N end, W beach, *Azorella,* 10.XII.1960, Gressitt (1). A213. N end, W beach, *Azorella,* 10.XII.1960, Gressitt (1). A213. N end, debris 17.XII.1960, Gressitt (1). A210. (ANARE) Gadget Gully, *Stilbocarpa* litter, 26.I.1961, Watson, M/61/Z/8 (1). *Sorensia subflava* det. Salmon. First Gully, *Poa foliosa* soil, 24.II.1961, Watson, M/61/Z/19 (1). *Sorensia subflava* det. Salmon. Plateau, herbfield soil, 19.I.1961, Watson, M/61/Z/3 (1). (BPBMED) North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI3a. *Sorensia subflava* det. Salmon. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI3b. *Sorensia subflava* det. Salmon. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI8. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI8. *Sorensia subflava* det. Salmon. South face North Head, soil, grass roots, 26.II.1965, Shoup (1). KWMI10. *Sorensia subflava* det. Salmon. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI22. *Sorensa subflava* det. Salmon. [No data] (1). *Sorensia subflava* det. Salmon. [No data] (1). *Sorensia subflava* det. Salmon.[No data] (1). *Sorensia subflava* det. Salmon.[No data] (1). *Sorensia subflava* det. Salmon. (ANARE) North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (5). Isthmus, litter nr. biology hut, -.XI.1972, Rounsevell 2(1). North Arm, *Azorella,* -.XI.1972, Rounsevell 6(2). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 7 (2). Isthmus, litter from near biology lab, 11.III.1975, Rounsevell (4). Isthmus, litter from near biology lab, 11.III.1975, Rounsevell (1). Isthmus, litter from near biology lab, 11.III.1975, Rounsevell (2). Bauer Bay, hut, 20m, *Poa foliosa-Stilbocarpa,* 19.X.1978, Copson 5 (1). Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 3 (1). Isthmus, coastal rock, *Colobanthus,* 20.XI.1977, Copson 1 (1).

Distribution. Falkland Is, Tierra del Fuego, Marion I, Kerguelen, Crozet Is, Heard I, Macquarie I (new record).

Delamere Deboutteville & Massoud (1966) described *Sorensia dreuxi* from Crozet I. Later (Delamere Deboutteville & Massoud 1968), they transferred *Isotoma punctata* Wahlgren, 1906 to *Sorensia* and accepted the other four species then recorded in the genus, but they suggested that *Sorensia punctata, S. subflava, S. minuta* and *S. dreuxi* may be synonymous.

Wise (1970a) independently synonymised *Sorensia dreuxi* with *S. subflava* and recorded the latter from South Georgia, Crozet I, Heard I, Campbell I, Auckland Is and Macquarie I (from Shoup specimens).

Deharveng (1981: 82, 91) placed the genus *Sorensia* Salmon, 1949 as a subgenus of *Isotoma* with the type species *Sorensia subflava* Salmon, 1949 of Campbell I. He transferred the species *Isotoma punctata* Wahlgren, 1906 to the same subgenus, as *Isotoma* (*Sorensia*) *punctata,* and synonymised *Sorensia dreuxi* DD. & M., 1966 with it but refrained from synonymising *S. subflava.* These two species, *I.* (*S.*) *subflava* and *I.* (*S.*) *punctata,* are here also considered as being separate and all previous records of the former on Macquarie I are found to be the latter.

Subgenus **Desoria** Nicolet, 1841

Isotoma (Desoria) tigrina (Nicolet, 1842)

Desoria tigrina Nicolet, 1842, Nouv.Mem.Soc.Helvet.Sci.Nat. 6: 59.
Isotoma klovstadi Womersley, 1937, Rep. BANZARE (B)4(1): 4 (Macquarie I) (non *Isotoma klovstadi* Carpenter, 1902).
Isotoma klovstadi: Gressitt & Weber, 1959, Pacific Ins. 1(4): 446 (Macquarie I).
Isotoma klovstadi: Pryor, 1962, Pacific Ins 4(3): 715 (Macquarie I).
Isotoma klovstadi: Gressitt, 1964, SCAR Symp. Paris, 1962: 220 (Macquarie I).
Isotoma klovstadi: Gressitt, 1965, Biogeography Ecology Land Arthropods Antarctica. In Biogeography Ecology Antarctica, 438, 444-46 (Macquarie I).
Isotoma klovstadi: Gressitt, 1965, Terrestrial Animals. In Antarctica, 368 (Macquarie I).
Isotoma sp. Wise, 1967, Ant. Res. Ser. 10: 137 (not *Isotoma klovstadi* Carpenter, 1902) (Macquarie I).
Isotoma sp.: Watson, 1967, ANARE Sci. Rep. (B)1(99): 18 (Macquarie I).
Isotoma sp.: Gressitt, 1970, Pacific Ins. Monogr.23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, Coll. 1669, 2.XII.1930 (1), *Isotoma klovstadi* det. Womersley. *Isotoma* n.sp. not *klovstadi* det. Wise, MI33a. Station 81, Coll. 1673, 3.XII.1930 (1), *Isotoma klovstadi* det. Womersley. *Isotoma* n.sp. not *klovstadi* det. Wise, MI33b. Station 81, Coll. 1673, 3.XII.1930 (1), *Isotoma klovstadi* det. Womersley. *Isotoma* n.sp. not *klovstadi* det. Wise, MI33c. Station 81, Coll. 1673, 3.XII.1930 (1), *Isotoma klovstadi* det. Womersley. *Isotoma* n.sp. not *klovstadi* det. Wise, MI33d. (ANARE) Nuggets Point, *Stilbocarpa* litter, 2.III.1961, Watson, M/61/Z/28 (1). *Isotoma* det. Salmon, 14. First Gully, *Stilbocarpa* litter, 24.II.1961, Watson, M/61/Z/20 (1). Salmon, 14. Gadget Gully, shearwater's burrow, 7.III.1961, Watson, M/61/Z/42 (1). Salmon, 14. Gadget Gully, shearwater's burrow, 7.III.1961, Watson, M/61/Z/42 (1). Salmon, 14. Gadget Gully, *Stilbocarpa,* 7.III.1961, Watson, M/61/Z/43 (1). *Isotomina* det. Salmon, 14. Gadget Gully, *Stilbocarpa* litter, 26.I.1961, Watson, M61/Z/8 (1). Salmon, 14. Nuggets Point, *Stilbocarpa* litter, 15.IX.1961, Watson, M/61/Z/175 (1). Salmon, 14. Nuggets Point, *Stilbocarpa* litter, 13.X.1961, Watson, M/61/Z/199 (1). Salmon, 14.(BPBMED) Mud, gravel, -.II.1965, Shoup (1). *Isotoma* n.sp. not *klovstadi* det. Wise, KWMI27a. Mud, gravel, -.II.1965, Shoup (1). *Isotoma* n.sp. not *klovstadi* det. Wise, KWMI27b. Mud, gravel, -.II.1965, Shoup (1). *Isotoma* n.sp. not *klovstadi* det. Wise, KWMI27d. (ANARE) Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (1). Gentoo Flats 5 m, *Stilbocarpa polaris* debris, 16.VIII.1978, Copson 9 (1).

Distribution. Almost cosmopolitan (including Australia, see Fjellberg 1979), Macquarie I (new record).

Womersley (1937) recorded Macquarie I specimens as the Antarctic *Isotoma klovstadi* Carpenter, 1902 but Wise (1967) considered the same specimens to belong to a different species. These and other specimens have now been determined from Fjellberg (1979), who re-described *Isotoma tigrina* (Nicolet, 1842), and the identification, of BANZARE specimens, has been confirmed by J. Najt. Not all characters are clear in some of the other specimens but they are included here for the time being.

Following the subgeneric arrangement by Deharveng (1981) this species is referred to here as *Isotoma* (*Desoria*) *tigrina.*

Fjellberg (1979) noted that the species is one of the most common and widespread

of *Isotoma* and is probably cosmopolitan. The present record is the most southerly known and the first for a subantarctic island.

Subgenus **Pseudosorensia** Izarra, 1972

Deharveng (1981) placed three species in this subgenus and provided a key. Following the discovery of one of these species on Macquarie I (see below) a modified key is presented here.

KEY TO SPECIES OF *ISOTOMA* (*PSEUDOSORENSIA*) (modified from Deharveng 1981)

1. Manubrium with 15 or fewer anterior setae, rami tenaculum with 1-3 setae, ciliated macrochaetae absent, claw without teeth ..... **I.(P.) atlantica** (Wise, 1970)

   Manubrium with more than 20 anterior setae, rami tenaculum with 3-4 setae, ciliated macrochaetae present, claw with or without teeth..... 2

2. Macrochaetae on posterior abdomen ciliated on all sides, claw with one internal tooth ..... **I.(P.) fueguensis** (Izarra, 1972)

   Macrochaetae on posterior abdomen ciliated unilaterally, claw without internal tooth ..... I.**(P.) subcaeca** Deharveng, 1981

Isotoma (Pseudosorensia) atlantica (Wise, 1970) (Figs.1-8)
Sorensia atlantica Wise, 1970, Pacific Ins. Monogr. 23: 197 (South Georgia I).

Macquarie I specimens recorded below are identical to the type specimens from South Georgia except that they are slightly smaller and appear to lack ocelli and pigmented eye patches. Following further examination some additions can now be made to the description of the species.

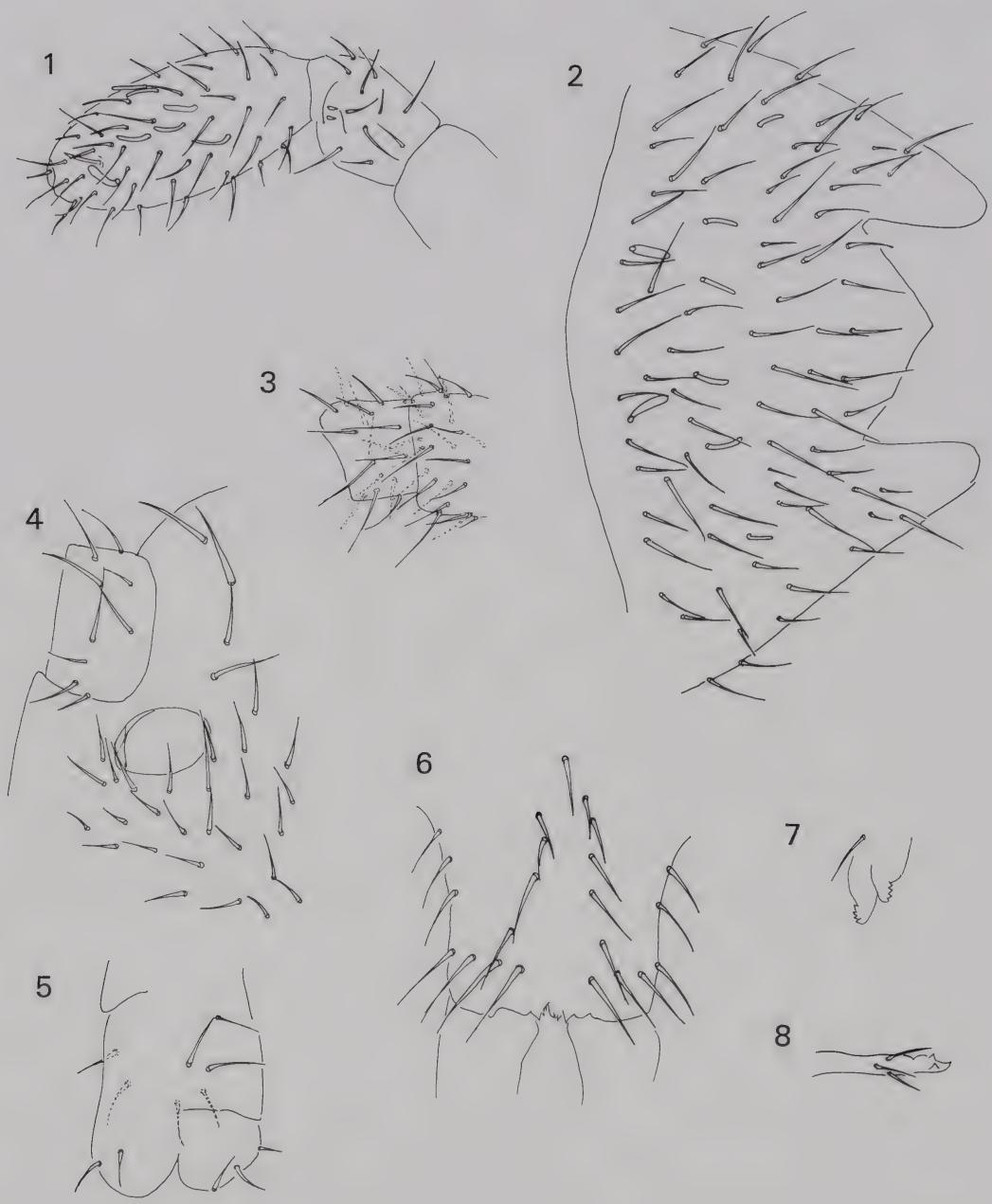
Size. 0.4-1.1 mm. *Body clothing.* Macrochaetae not well developed; abdominal setae fairly short and smooth, (no ciliated macrochaetae as stated by Deharveng 1981); sensory setae accp (3 + 3) and as (1 + 1) on abdomen V / VI well developed, short broad and rounded. *Antennae IV.* Antenna IV with 6 large sensory setae and apical organite well developed. *Furca.* No spines on dens or manubrium, mucro with 3 teeth; anteriorly manubrium with 10-15 setae. Rami tenaculum with 1-3 setae.

Specimens examined. MACQUARIE I. (ANARE) Plateau, -.XI.1972, Rounsevell 4 (2). Plateau, -.XI.1972, Rounsevell 4 (1).

Distribution. South Georgia (type locality), Macquarie I (new record).

Following the description of the genus *Pseudosorensia* by Izarra (1972) it appeared that the present species, of South Georgia, would be congeneric with the type species *Pseudosorensia fueguensis* Izarra, 1972 of Tierra del Fuego. Subsequently, Deharveng (1981) placed *Pseudosorensia* as a subgenus of *Isotoma* and transferred the present species to it.

Until more specimens are available from Macquarie I, the specimens recorded here are referred to *I.* (*P.*) *atlantica* but may represent a different species.



Figs.1-8. *Isotoma* (*Pseudosorensia*) *atlantica* (Wise 1970). Female from Plateau, Macquarie I. 1. Antenna III and IV, external view. 2. Abdomen V, VI, dorsal view. 3. Antenna I and II dorsal view. 4. Anterior region of head, lateral view. 5. Ventral tube, lateral view. 6. Manubrium, anterior view. 7. Rami tenaculum and seta, anterior view. 8. Mucro, lateral view.

Genus **Cryptopygus** Willem, 1902

Cryptopygus antarcticus antarcticus Willem, 1901

Cryptopygus antarcticus Willem, 1901, Ann. Soc. Ent. Belg. 45: 261.
Cryptopygus antarcticus: Wise, 1967, Ant. Res. Ser.10: 133, 134, 146 (Macquarie I).
Cryptopygus antarcticus: Gressitt, 1967, Ant. Res. Ser. 10: 14 (Macquarie I).
Parafolsomia sp. Watson, 1967, ANARE Sci. Rep. (B)1(99):18 (Macquarie I).
Cryptopygus sp. Watson, 1967, ANARE Sci. Rep. (B) 1(99):18 (Macquarie I).
Cryptopygus antarcticus: Wise, 1970, Pacific Ins. Monogr. 23:192 (Macquarie I).
Cryptopygus antarcticus: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).
Cryptopygus antarcticus: Tilbrook, 1970, Antarctic Ecology 2: 909 (Macquarie I).
Cryptopygus antarcticus: Block & Tilbrook, 1975, Oikos 26: 16 (Macquarie I).
Cryptopygus antarcticus antarcticus: Deharveng, 1981, C.N.F.R.A. 48:72 (Antarctica, Kerguelen).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, Coll. 1669, 2.XII.1930 (1). (BPBMED) NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A128. NE 2 m, *Poa,* 10.XII.1960, Gressitt (1). A131. NE 2m, *Poa,* 10.XII.1960, Gressitt (1). A119. NE coast, tussock, behind beach 2m, 10.XII.1960, Gressitt (1). A135. NE 2 m, *Poa,* 10.XII.1960, Gressitt (3). A123. *Cryptopygus antarcticus* det. Salmon. NE coast, tussock, behind beach 2 m, 10.XII.1960, Gressitt (2). A127. *Cryptopygus antarcticus* det. Salmon. (ANARE) Aerial Cove, *Colobanthus muscoides,* 24.I.1961, Watson, M/61/Z/6 (1). *Cryptopygus* det. Salmon, 1. North Head, coastal rocks, 27.VI.1961, Watson, M/61/Z/110 (1). Salmon 1. Garden Cove, coastal rocks, 20.VI.1961, Watson, M/61/Z/155 (1). Salmon 1. Gadget Gully, shearwater's burrow, 7.III.1961, Watson, M/61/Z/42 (1). Salmon, 1. Aerial Cove, *Colobanthus,* 24.I.1961, Watson M/61/Z/7 (1). Salmon, 1. Aerial Cove, Gentoo rookery, 23.II.1961, Watson, M/61/Z/13 (1). *Parafolsomia* det. Salmon, 4. (BPBMED) South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI16a. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI16b. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI16c. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI16d. South of Island Lake 213 m, soil, gravel, low plants, 24.II.1965, Shoup (1). KWMI16e. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI18. Top of Gadget Gully 183 m, soil, stones, low plants, 24.II.1965, Shoup (1). KWMI29. Top of Gadget Gully 183 m, soil, stones, low plants, 24.II.1965, Shoup (1). KWMI29. (ANARE) Plateau, -.XI.1972, Rounsevell 4 (1). North Arm, *Azorella,* -.XI.1972, Rounsevell 6 (2). Isthmus, coastal rock, *Colobanthus,* 20.XI.1977, Copson 1 (1). Bauer Bay beach, *Colobanthus* in coastal rock, 19.X.1978, Copson 4 (1). Isthmus, coastal rock, *Colobanthus,* 20.XI.1977, Copson 1 (3).

Distribution. Antarctica (type locality, Kerguelen, Macquarie I (new record as subspecies).

Cryptopygus antarcticus is widely distributed in Antarctica (Antarctic Peninsula, type locality) and the subantarctic islands (Wise 1967, 1970a, 1971) including Macquarie I (Wise 1967, from Shoup and Gressitt specimens). *Cryptopygus antarcticus antarcticus* was recorded by Deharveng (1981) from Antarctica and Kerguelen only but specimens from Macquarie I appear to belong to this subspecies.

Cryptopygus caecus Wahlgren, 1906

Cryptopygus caecus Wahlgren, 1906, Wise. Ergebn. Schwed. Sudpolar-Exped. (1901-1903) 5(9):12.

Specimens examined. MACQUARIE I. (ANARE) Hasselborough Bay, Razorback Ridge, east and west sides, soil under *Poa foliosa,* 3.II.1982, Cronin & Montgomery (2).

Distribution. Southern Hemisphere (see Wise 1967, 1970a, 1974; Deharveng 1981) including South Georgia (type locality), Macquarie I (new record).

Although both specimens are immature, one is subadult and agrees in details of chaetotaxy with Deharveng's (1981) description of *C. caecus.*

Cryptopygus dubius Deharveng, 1981
Cryptopygus dubius Deharveng, 1981, C.N.F.R.A. 48:76 (Marion I).

Specimens examined. MACQUARIE I. (ANARE) Isthmus, debris under *Poa foliosa,* 17.XI.1977, Copson 3 (1).

Distribution. Marion I (type locality), Macquarie I (new record).

Cryptopygus dubius was described from Marion I but has been found to occur in Australia also (Greenslade in press). It was recorded by Womersley (1939) as *Proisotoma* (*Proisotoma*) *ripicola* Linnaneimi, 1912.

Cryptopygus lawrencei Deharveng, 1981
Cryptopygus lawrencei Deharveng, 1981, C.N.F.R.A. 48:79 (Kerguelen I).

Specimens examined. MACQUARIE I. (ANARE) Isthmus, coastal rock with *Colobanthus muscoides* cushion, 20.XI.1977, Copson 1(2). Isthmus, coastal rock with *Colobanthus muscoides* cushion, 20.XI.1977, Copson 1(10). Isthmus, soil and mosses on rock at high tide zone, 18.IX.1977, Copson 8 (1). Isthmus, soil and mosses on rock at high tide zone, 18.IX.1977, Copson 8 (1). Isthmus, soil and mosses on rock at high tide zone, 18.IX.1977, Copson 8 (1). Isthmus, soil and mosses on rock at high tide zone, 18.IX.1977, Copson 8 (1). Isthmus, soil and mosses on rock at high tide zone, 18.IX.1977, Copson 8 (1).

Distribution. Kerguelen (type locality), Macquarie I (new record).

Cryptopygus tricuspis Enderlein, 1909
Cryptopygus tricuspis Enderlein, 1909, Deutsche Sudpolar Exped. (1901-1903) 10(4):459 (Kerguelen I).
Parafolsomia quadrioculata: Wise, 1970, Pacific Ins. Monogr. 23:194 (South Georgia).
Cryptopygus quadrioculatus: Wise, 1974, Rec. Auckland Inst. Mus. 11:211 (South Georgia).
Cryptopygus quadrioculatus: Deharveng, 1981, C.N.F.R.A. 48:77 (South Georgia).

Specimens examined. MACQUARIE I. (BPBMED) North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI4a. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI4b. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI4. North Head 15 m, moss, low plants, soil, 26.II.1965, Shoup (1). KWMI4. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI7a. Base of Mt Power 152 m, soil, 24.II.1965, Shoup (1). KWMI7b. North of Nuggets Pt, sea level, soil, 25.II.1965, Shoup (1). KWMI14. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI19. Near Scoble Lake 268 m, soil, gravel, 24.II.1965, Shoup (1). KWMI19. Top of Gadget Gully 183 m, soil, stones, low plants, 24.II.1965, Shoup (1). KWMI30a. Top of Gadget Gully 183 m, soil,

stones, low plants, 24.II.1965, Shoup (1). KWMI30b. (ANARE) Garden Cove, 28.XII.1981, Cronin (1). Garden Cove, 28.XII.1981, Cronin (1). Hasselborough Bay, soil under *Poa foliosa,* 20.I.1982, Cronin (4). Hasselborough Bay, soil under *Poa foliosa,* 20.I.1982, Cronin (2). Hasselborough Bay, soil under *Poa foliosa,* 20.I.1982, Cronin (6).

Distribution. Kerguelen (type locality), Crozet I, Marion I, Macquarie I (new record).

Parafolsomia quadrioculata was described by Wise (1970a) from South Georgia and later transferred to *Cryptopygus* (Wise 1974). Deharveng (1981) commented that it is close to *Cryptopygus tricuspis.* BANZARE specimens from Kerguelen, determined as *C. tricuspis* by Womersley, show no differences from the Macquarie I specimens. *Parafolsomia quadrioculata* Wise, 1970 has recently been synonymised with *Cryptopygus tricuspis* Enderlein by Greenslade (1986).

It should be noted that the combination *Cryptopygus quadrioculatus* (Wise, 1970) is a junior secondary homonym of *Cryptopygus quadrioculatus* (Rapoport, 1963), as is *C. quadrioculatus* (Martynova, 1967), but as the species is now synonymised no further action is required.

Family ENTOMOBRYIDAE Schäffer, 1896

Genus **Lepidobrya** Womersley, 1937

Lepidobrya mawsoni (Tillyard, 1920)

Entomobrya mawsoni Tillyard, 1920, Australas. Ant. Exped. 1911-14 Sci. Rep. (C)5(8): 11 (Macquarie I).
Entomobrya mawsoni: Tillyard, 1925, N.Z. J. Sci. Tech. 7(5): 302.
Entomobrya mawsoni: Tillyard, 1926, Insects Australia New Zealand, 56 (Macquarie I).
Entomobrya mawsoni: Enderlein, 1930, Ges. Naturf. Freund Berlin : 263 (Macquarie I).
Lepidobrya mawsoni: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1): 5 (Macquarie I).
Lepidobrya mawsoni: Salmon, 1949, Cape Exped. Ser. Bull. 4: 43 (Macquarie I).
Lepidobrya mawsoni: Wise, 1964, Pacific Ins. Monogr. 7: 198 (Macquarie I).
Lepidobrya mawsoni: Watson, 1967, ANARE Sci.Rep. (B)1(99):19 (Macquarie I).
Lepidobrya mawsoni: Gressitt, 1970, Pacific Ins. Monogr. 23:325 (Macquarie I).

Specimens examined. MACQUARIE I. (AEE) Garden Bay, common under stones in Victoria Penguin rookery, 20.VIII.1912, C24 (2). AAE 12 K42846 *Entomobrya mawsoni* det. Tillyard. Holotype and paratype. N end, 1.19.12 (*sic*), C25 (1). AAE 13 K42848 *Entomobrya mawsoni* det. Tillyard. (BANZARE) Buckles Bay (1). *Lepidobrya mawsoni* det. Womersley. (BPBMED) N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (1). A153. N end, moss *Azorella,* 7.XII.1960, Gressitt (1). A151. NE 25 m, Gadget Gully, sweeping, 6.XII.1960, Gressitt (1). A148. *Lepidobrya mawsoni* det. Salmon. N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (1). A153. *Lepidobrya mawsoni* det. Salmon. N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (2). A153. 100 m N, *Stilbocarpa,* 5.XII.1960, Gressitt (2). A150. *Lepidobrya mawsoni* det. Salmon. Green Gorge, tussock, 4.XII.1960, Gressitt (1). A149. *Lepidobrya mawsoni* det. Salmon. Base 2 m tussock, roots, soil, 5.XII.1960, Gressitt (1). A152. *Lepidobrya mawsoni* det. Salmon. (ANARE) North Head, *Stilbocarpa* litter, 27.II.1961, Watson, M/61/Z/22 (1). *Lepidobrya mawsoni* det. Salmon, 6. North Head, *Stilbocarpa* litter, 27.II.1961, Watson, M/61/Z/22 (1). *Lepidobrya mawsoni* det. Salmon, 6. First Gully, *Stilbocarpa* litter, 24.II.1961, Watson, M/61/Z/20 (1).

Lepidobrya mawsoni det. Salmon, 6. Wireless Hill, *Stilbocarpa* litter, 5.IV.1961, Watson, M/61/Z/69 (1). *Lepidobrya mawsoni* det. Salmon, 6. Camp Hill, *Poa annua,* 4.VII.1961, Watson, M/61/Z/112 (1). *Lepidobrya mawsoni* det. Salmon, 6. Lambing Gully, *Stilbocarpa* leaves, 30.IX.1961, Watson, M/61/Z/189 (1). *Lepidobrya mawsoni* det. Salmon, 6. Nuggets Point, *Stilbocarpa* litter, 13.X.1961, Watson, M/61/Z/199 (1). *Lepidobrya mawsoni* det. Salmon, 6. Isthmus, coastal rocks, 19.IV.1961, Watson, M/61/Z/74 (1). *Lepidobrya mawsoni* det. Salmon, 6. Gadget Gully, *Stilbocarpa* litter, 7.III.1961, Watson, M/61/Z/41 (1). *Lepidobrya mawsoni* det. Salmon. Nuggets Point, *Stilbocarpa* litter, 15.IX.1961, Watson, M/61/Z/175 (1). *Lepidobrya mawsoni* det. Salmon. Camp Hill, *Poa annua* and *foliosa,* 13.VII.1961, Watson, M/61/Z/120 (1). *Lepidobrya mawsoni* det. Salmon. North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (1). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 7 (10). Isthmus, litter nr. Biology lab. 11.III.1975, Rounsevell (2). Isthmus, *Poa* debris, 17.XI.1977, Copson 2 (1).

Distribution. Macquarie I (type locality), Campbell I.

Tillyard (1920) mentioned a third specimen of this species on slide AAE I3 together with specimens of *Arrhopalites davidi,* and it is presumed here that the former was taken at the same time and place as the latter.

The one Campbell I specimen has been re-examined and is apparently of this species. It may have been introduced or of introduced stock.

Genus **Lepidocyrtus** Bourlet, 1839

Lepidocyrtus cyaneus cinereus Folsom, 1924
Lepidocyrtus cyaneus var. *cinereus* Folsom, 1924, Amer. Mus. Novit. 108:9.
Lepidocyrtus cyaneus cinereus: Watson, 1967, ANARE Sci. Rep. (B)1(99): 19 (Macquarie I).
Lepidocyrtus cyaneus cinereus: Gressitt, 1970, Pacific Ins. Monogr. 23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (ANARE) Nuggets Point, *Stilbocarpa* litter, 26.XI.1961, Watson, M/61/Z/221 (1). *Lepidocyrtus cyaneus cyaneus* det. Salmon, 6. Nuggets Point, *Stilbocarpa* litter, 2.III.1961, Watson, M/61/Z/27 (1).*Lepidocyrtus cyaneus* det. Salmon, 18. Nuggets Point, *Stilbocarpa* litter, 15.IX.1961, Watson, M/16/Z/175 (1). *Lepidocyrtus cyaneus cinereus* det. Salmon, 6. Nuggets Point, *Stilbocarpa* litter, 13.X.1961, Watson, M/61/Z/199 (1). *Lepidocyrtus cyaneus cyaneus* det. Salmon, 6.

Distribution. North America (see Salmon 1964a), New Zealand, Campbell I, Macquarie I.

This species was recorded by Wise (1964) from Campbell I, and by Watson (1967) from Macquarie I for these same four specimens determined by Salmon.

The determinations of *Lepidocyrtus cyaneus cyaneus* on two of Salmon's slides are considered to be a *lapsus* for *L.cyaneus cinereus* as Watson's specimens identified by Salmon were recorded under the latter name. However, further examination suggests that the Macquarie I specimens may not be *L. cyaneus* but fresh specimens are required for a definite specific identification.

Genus **Lepidosira** Schött, 1925

Lepidosira terraereginae (Ellis & Bellinger, 1973)

Lepidocyrtus terraereginae Ellis & Bellinger, 1973, Monogr. Ned. Ent. Ver. No.7:28 [nom. nov. for *Lepidocyrtus* (*Lepidocyrtoides*) *coeruleus* Schött, 1917].
Lepidocyrtus (*Lepidocyrtoides*) *coeruleus* Schött, 1917, Ark. Zool. 11(8):45.
[*Lepidosira terraereginae*] Ellis & Bellinger, 1973, Monogr. Ned. Ent. Ver. No.7:28.

Specimens examined. MACQUARIE I. (BPBMED) Mud, gravel, -.II.1965, Shoup (1). KWMI24. *Lepidosira caerulea* det. Salmon. Mud, gravel, -.II.1965, Shoup (1). KWMI24. *Lepidosira caerulea* det. Salmon. Mud, gravel, -.II.1965, Shoup (1). KWMI24. *Lepidosira caerulea* det. Salmon.

Distribution. Australia (Queensland, type locality), New Zealand, Macquarie I (new record).

This species has mostly been known as *Lepidosira coerulea* (Schött, 1917) (see Salmon 1964a) and is recorded here only for the three specimens determined by Salmon.

Family SMINTHURIDAE Lubbock, 1862

Genus **Polykatianna** Salmon, 1946

Polykatianna davidi (Tillyard, 1920)

Arrhopalites davidi Tillyard, 1920, Australas. Ant. Exped. Sci. Rep. (C)5(8): 14-16 (Macquarie I).
Arrhopalites davidi: Tillyard, 1925, N.Z. J. Sci. Tech. 7(5):302-303 (Macquarie I).
Arrhopalites davidi: Tillyard, 1926, Insects Australia New Zealand, 56 (Macquarie I).
Arrhopalites davidi: Enderlein, 1930, Ges. Naturf. Freund Berlin: 263 (Macquarie I).
Parakatianna davidi: Womersley, 1937, Rep. B.A.N.Z.A.R.E. (B)4(1): 6 (Macquarie I).
Polykatianna davidi: Salmon, 1949, Cape Exped. Ser. Bull. 4: 54 (Macquarie I).
Metakatianna gressitti: Watson, 1967, ANARE Sci. Rep. (B)1(99): 20 (Macquarie I).
Polykatianna davidi: Gressitt, 1970, Pacific Ins. Monogr. 23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (AAE) N end. Jumping arthropods. Common under stones, in crevices of rock, and under moss. Have tremendous powers of jumping when touched. 1.19.12 (*sic*), C25 (5). AAEI3 K42848 *Arrhopalites davidi* det. Tillyard. Holotype and 4 paratypes. [No data] (1). *Arrhopalites davidi* det. Tillyard. Paratype. (BANZARE) BANZ 1930, *Metakatianna davidi* det. Womersley. Station 81, 2.XII.1930, Coll.1669 (6). *Metakatianna davidi* det Womersley. Station 81, 2.XII.1930, Coll.1669 (4). *Metakatianna davidi* det Womersley. 1930 (1). *Metakatianna davidi* det Womersley. (ANARE) Gadget Gully, 5.XII.1960, Calaby, M/60/In/11a (1). Lambing Gully, *Stilbocarpa* leaves, 30.XI.1961, Watson, M/61/Z/189 (1). *Metakatianna gressitti* det. Salmon, 10. Lambing Gully, *Stilbocarpa* leaves, 30.IX.1961, Watson, M/61/Z/189 (1). *Metakatianna gressitti* det. Salmon, 10. Lambing Gully, *Stilbocarpa* leaves, 17.VIII.1961, Watson, M/61/Z/151 (1). *Metakatianna gressitti* det. Salmon, 10. Lambing Gully, *Stilbocarpa* leaves, 20.VI.1961, Watson, M/61/Z/102 (1). *Metakatianna gressitti* det. Salmon, 10. Aerial Cove, *Montia fontana,* 29.III.1961, Watson, M/61/Z/65 (1). *Metakatianna gressitti* det. Salmon, 10. Aerial Cove, *Montia fontana,* 29.III.1961, Watson, M/61/Z/65 (1). *Metakatianna gressitti* det. Salmon, 10. North Head, *Poa hamiltoni,* 3.III.1961, Watson, M/61/Z/33 (1). *Metakatianna*

gressitti det. Salmon, 10. First Gully, *Stilbocarpa* plants, 24.II.1961, Watson, M/61/Z/17 (1). *Metakatianna gressitti* det. Salmon. Lambing Gully, *Stilbocarpa* leaves, 17.VIII.1961, Watson, M/61/Z/151 (1). *Metakatianna gressitti* det. Salmon. Isthmus, on top of old seal wallow, 14.I.1962, Hughes (1). A237. Isthmus, on top of old seal wallow, 14.I.1962, Hughes (1). A237. Isthmus, on top of old seal wallow, 14.I.1962, Hughes (1). A237. Isthmus, on top of water in seal wallow, 18.III.1962, Hughes (1). A235. North Head, on Macquarie Island Cabbage, 10.III.1962, Hughes (1). A239. North Head, on Macquarie Island Cabbage, 10.III.1962, Hughes (1). A239. Bauer Bay, nearly dry wallow, 23.III.1962, Vestjens, M/62/1M/149 (1). Bauer Bay, between *Stilbocarpa polaris,* 13.IV.1962, Vestjens (1). Bauer Bay, tussock grass, 5.X.1962, Vestjens, M/62/In/162 (2). (BPBMED) Mud, gravel, -.II.1965, Shoup (1). KWMI25. *Metakatianna* det. Salmon. North of Nuggets Pt, sea level, soil, 25.II.1965, Shoup (1). KWMI15. *Metakatianna* det. Salmon. North of Nuggets Pt, sea level, soil, 25.II.1965, Shoup (1). KWMI15. *Metakatianna* det. Salmon.

Distribution. Macquarie I (type locality).

The specimens collected by Watson were recorded by him (1967) as *Metakatianna gressitti* Salmon following determination by Salmon. That species is now placed in the genus *Polykatianna* (see below) and the Watson specimens appear to belong in the same genus. However, they differ from *P. gressitti* in the following characters: Vertex setae longer, antenna IV appears annulated, antenna longer in relation to head, body setae longer relative to breadth, no teeth or tunica on claw, empodial lamella broader, claw longer and thinner (?), anterior dental chaetotaxy 11124 (i.e. 9 not 10 setae), and mucro longer and thinner. These specimens, collected by Watson, appear to be mostly females and to belong to the same species but the preparations are not clear and the appendages have shrivelled so that morphological details are hard to distinguish. The colour pattern is dark purplish mottling on abdomen and thorax, a rectangular pigment patch on vertex and another between and below the ocelli, and all appendages plus abd. V and VI are more lightly and smoothly pigmented. This is similar to the coloration of *P. davidi* as recorded by Tillyard (1920) "deep purplish black above" and distinct from that of *P. gressitti* recorded by Salmon (1964) "pale ochreous with violet shading". The Watson specimens are consequently tentatively included here.

Polykatianna gressitti (Salmon, 1964) comb. nov.
Metakatianna gressitti Salmon, 1964, Pacific Ins. 6 (2): 317 (Macquarie I).
Metakatianna gressitti: Gressitt, 1970, Pacific Is. Monogr. 23: 235 (Macquarie I).

Additions to description of Type specimen.

Male. *Size,* 1.224 mm. *Colour.* Completely bleached. *Head.* Antennal segment ratio 6:10:16:43. Vertex setae short, curved, strong. *Body.* Covered with short, strong, curved setae. Trichobothria ABC present, ∠ ABC = 140°, AB:BC = 1:2.8. *Legs.* Trochanteral organ present legs III:II, coxal organ present leg III. Three clavate tenent hairs to each leg. Claw with teeth and tunica as described by Salmon.

Furca. Chaetotaxy formula as below:

anterior		1	1	1	1	2	4	10
internal							1	1
dorsal	1	2	1		1	1	1	7
external	1	1	1	1	1	1		6
								24

Mucro with broad slightly indented lamellae.

Abdominal segment V. Male with 19 + 18 setae at opening.

Specimens examined. MACQUARIE I. (BPBMED) Base 2 m, tussock, roots, soil, 5.XIII.1960, Gressitt (1). A140. *Metakatianna gressitti* det. Salmon. Holotype.

Distribution. Macquarie I (type locality).

Salmon's (1964b) description of *Metakatianna gressitti* appears essentially correct. The body trichobothria are small and difficult to see which accounts for Salmon initially placing the species in *Metakatianna.* The size is over twice what he records, and there are three extra setae on antenna III and two on the ocelli patch compared with his figures 16 and 21. His description was based on a single specimen collected by Gressitt. At present the species is placed in *Polykatianna* until a definitive diagnosis of the genus can be made following further collections from the type locality.

Genus **Sminthurinus** Börner, 1901

Sminthurinus kerguelensis Salmon, 1964
Sminthurinus kerguelensis Salmon, 1964, Pacific Ins. 6(2): 314 (Kerguelen, Macquarie).
Sminthurinus kerguelensis: Gressitt, 1970 Pacific Ins. Monogr. 23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (BPBMED) N end (NW), *Pleurophyllum* debris, 10.XII.1960, Gressitt (1). A139. *Sminthurinus kerguelensis* det. Salmon. Top of Gadget Gully 183 m, soil, stones, low plants, 24.II.1965 Shoup (1). KWMI32.

Distribution. Kerguelen (type locality), Macquarie I.

The holotype, allotype and other Kerguelen specimens in the BANZARE collection have been re-examined. In the original description Salmon (1964b) recorded one specimen from Macquarie I. This slide mounted specimen, collected by Gressitt (A139), has been examined and another similar specimen, also labelled A139, has been found in alcohol.

Genus **Katianna** Börner, 1906

Katianna banzarei Salmon, 1964
Katianna banzarei Salmon, 1964, Pacific Ins. 6(2): 314 (Macquarie I).
Katianna banzarei: Watson, 1967, ANARE Sci. Rep. (B) 1 (99): 19 (Macquarie I).
Katianna banzarei: Gressitt, 1970, Pacific Ins. Monogr. 23: 325 (Macquarie I).

Specimens examined. MACQUARIE I. (BANZARE) Station 81, swampy land near Buckles Bay, 3.XII.1930, Res. 234-d (1). *Katianna banzarei* det. Salmon. Holotype. Station 81, swampy land near Buckles Bay, 3.XII.1930, Res. 234-d (1). *Katianna banzarei* det. Salmon. Paratype. (ANARE) Green Gorge, 4.XII.1960, Calaby, M/60/In/9A (1). Gadget Gully, 5.XII.1960, Calaby, M/60/In/11a (1). Lambing Gully, *Stilbocarpa* leaves, 1.XII.1961, Watson, M/61/Z/231 (1).*Katianna banzarei* det. Salmon, 3. Wireless Hill, sheep dung, 29.XI.1961, Watson, M/61/Z/468 (1). *Katianna banzarei* det. Salmon, 3. Wireless Hill, sheep dung, 29.XI.1961, Watson, M/61/2/468 (1). *Katianna banzarei* det. Salmon, 3. Lambing Gully, *Stilbocarpa* leaves, 17.VIII.1961, Watson, M/61/Z/151 (1). *Katianna banzarei* det. Salmon, 3. Lambing Gully, *Stilbocarpa* leaves, 20.VI.1961, Watson, M/61/Z/102 (1). *Katianna banzarei* det. Salmon, 3. Nuggets Point, *Stilbocarpa* litter, 2.III.1961, Watson, M/61/Z/27 (1). *Katianna banzarei* det. Salmon, 3. First Gully, *Stilbocarpa* plants, 24.II.1961, Watson, M/61/Z/17 (1). *Katianna banzarei* det. Salmon, 3. Lambing Gully. *Stilbocarpa* leaves, 30.IX.1961, Watson, M/61/Z/189 (1). *Katianna banzarei* det. Salmon, 3. North Head, on Macquarie Island Cabbage, 10.III.1962 Hughes (1). A240. North Head on *Stilbocarpa polaris,* 12.VI.1962, Vestjens, M/62/1M/153 (1). Bauer Bay, tussock grass, 5.X.1962, Vestjens, M/62/In/162 (2). North Arm, *Azorella,* -.XI.1972, Rounsevell 6 (1). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 7 (3). Isthmus, litter from near biology hut, 11.III.1975, Rounsevell (1). Hasselborough Bay, Razorback Ridge, east and west sides, soil under *Poa foliosa,* 3.II.1982, Cronin & Montgomery (1). Hasselborough Bay, Razorback Ridge, east and west sides, soil under *Poa foliosa,* 3.II.1982, Cronin & Montgomery (1).

Distribution. Macquarie I (type locality).

Family NEELIDAE Folsom, 1896

Genus **Megalothorax** Willem, 1900

Megalothorax sp.

Specimens examined. MACQUARIE I. (ANARE) North Arm, *Sphagnum*, -.XI.1972, Rounsevell 1 (2). North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (2). North Arm, *Sphagnum,* -.XI.1972, Rounsevell 1 (2). North Arm, *Stilbocarpa,* -.XI.1972, Rounsevell 7 (2).

Distribution. Macquarie I.

The few specimens available are not identified as the genus is poorly known.

SUMMARY

In recent years there have been many taxonomic changes in nomenclature for the Southern Hemisphere Collembola particularly since Deharveng (1981). Several species are listed here under different names following synonymic and combination changes.

Of the 23 species now recognised for Macquarie I (including Bishop I), 15 species have been recorded under various names prior to the present study.

Ten species are as previously recognised: *Hypogastrura* (*Hypogastrura*) *purpurescens, Hypogastrura* (*Hypogastrura*) *viatica, Tullbergia bisetosa, Cryptopygus antarcticus antarcticus, Lepidobrya mawsoni, Lepidocyrtus cyaneus cinereus, Polykatianna davidi, Polykatianna gressitti* (new combination), *Sminthurinus kerguelensis, Katianna banzarei.*

Name changes arising from recognition of several previously misidentified species in the Macquarie I Collembola provide 5 new species records. In the Family Neanuridae the species recorded as *Subantarctica* sp. is *Friesea tilbrooki* of South Georgia (recorded by Greenslade 1986). In the Onychiuridae some specimens from Macquarie I recorded as *Tullbergia mixta* and some from Bishop I recorded as *Tullbergia mediantarctica* are *Tullbergia templei* of Heard I (recorded by Greenslade 1986). The species recorded in the Isotomidae as *Isotoma octooculata* is *Isotoma* (*Parisotoma*) *insularis* of Crozet I, *Sorensia subflava* is *Isotoma* (*Sorensia*) *punctata* of Tierra del Fuego and subantarctic islands, *Isotoma klovstadi* is the cosmopolitan *Isotoma* (*Desoria*) *tigrina.*

Specimens of 8 species have been found in Macquarie I collections for the first time during the present studies. These are *Hypogastrura* (*Ceratophysella*) *denticulata* (recorded by Greenslade & Wise 1984), *Isotoma* (*Pseudosorensia*) *atlantica, Cryptopygus dubius, Cryptopygus caecus, Cryptopygus lawrencei, Cryptopygus tricuspis, Lepidosira terraereginae* and *Megalothorax* sp.

Macquarie I is the type locality for four of the species, *Lepidobrya mawsoni, Polykatianna davidi, Polykatianna gressitti* and *Katianna banzarei*, all of which are endemic to the island (except for one specimen of *L. mawsoni* recorded elsewhere). No new species are described although additions to descriptions are given for some species.

While the number of species for Macquarie I has been increased substantially and several species have been properly determined, some are only represented by few or poorly preserved specimens. Fresh specimens of those species are required to complete the identification of all Collembola species present on the island.

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